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Japan

PUBLIC VOCATIONAL TRAINING IN JAPAN
PRESENT SITUATION AND PROBLEMS

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Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

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PUBLIC VOCATIONAL TRAINING IN JAPAN

— PRESENT SITUATION AND PROBLEMS —

by

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I PREFACE

1. Skilled workers in Japan are chiefly fostered under the Vocational Training Law(2) enacted in 1958 to meet an increasing demand for skilled workers and the necessity of improving the skill of workers actually employed in industry. The purpose of the law is to foster skilled workers needed for the manufacturing and other industries by providing vocational training and conducting trade skill test in order to enable workers to enjoy greater security of employment and improved status as well as to contribute to the development of the national economy.

2. The vocational training based on the Vocational Training Law is divided into two categories; "public vocational training" provided to applicants for employment by the State, the Prefectural Government and so on; and "vocational training within industry" provided by employers for their employees.

3. If we compare them with those of European countries, it is characteristic that the public vocational training plays a big role in fostering the skilled workers in our country. As to the vocational training within industry, apprenticeship similar to the one predominant in European countries can be found only in some skill-trades of our domestic industries, while as a general form of vocational training within industry, employers and cooperation of employers provide training systematically to their employees during their working hours and pay ordinary wages to employees.

4. This is because the development of capitalistic method of production in Japan had been behind that of European countries and our system had been established by transplanting high level of skills in those countries for a short period, and therefore, there was no continuation of tradition between the fostering of guild craftsmen before the Meiji Restoration and the fostering of the skilled workers in the present age of capitalistic factory production, and, moreover, owing to the lack of skilled workers, the intention of enterprises to foster their own skilled workers for themselves was very strong.

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(1) The author is the Director of Vocational Training Bureau.

(2) Before the enactment of the Vocational Training Law, the vocational training was provided as the vocational training and supervisory training under the Employment Security Law and the apprenticeship under the Labour Standards Law.

5. We shall introduce our vocational training including the present situation and problems of public vocational training, so as to contribute to the economic development of the developing countries the conditions of which are akin to those in our old days.

II OUTLINE OF PUBLIC VOCATIONAL TRAINING

6. As above mentioned, the skilled workers are chiefly fostered by public vocational training and vocational training within industry. Public vocational training means vocational training provided in the ordinary Vocational Training Centre, General Vocational Training Centre, Central Vocational Training Centre and Vocational Training Centre for Physically Handicapped Persons. The establishment and the activity of each category of vocational training centre are as follows.

Ordinary Vocational Training Centre

7. The ordinary Vocational Training Centre provides applicants for employment with vocational training for basic skills and may conduct the following business as far as no hindrance is placed to the business afore-mentioned; providing employed workers with vocational training for basic skills, conducting business concerning assistance with respect to vocational training within industry. The centre is established and operated by the Prefectural Government and a half of the expenses necessary for the centre are borne by the State, as provided for by the Cabinet Order.

General Vocational Training Centre

8. The General Vocational Training Centre provides employed workers and applicants for employment with vocational training for special skills and conduct business concerning assistance with respect to vocational training within industry. The centre is established and operated by the Employment Promotion Projects Corporation(3) as welfare facilities of the Unemployment Insurance. The expenses necessary for the centre are paid out of the receipts of interest drawn from the reserve fund of the Unemployment Insurance Account.

Central Vocational Training Centre

9. The Central Vocational Training Centre conducts research and study of vocational training. The centre is established and operated by the Employment Promotion Projects Corporation as welfare facilities of the Unemployment Insurance. The necessary expenses are paid out of the receipts of interest drawn from the reserve fund of the Unemployment Insurance Account.

Vocational Training Centre for Physically Handicapped Persons

10. The Vocational Training Centre for Physically Handicapped Persons provides vocational training to physically handicapped persons who find it difficult to receive vocational training in the ordinary Vocational Training Centre, General Vocational Training Centre or Central Vocational Training Centre. The centre is established by the State and the Prefectural Government. The State bears a half of the expenses necessary for the Vocational Training Centre for Physically Handicapped Persons established by the Prefectural Government.

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(3) The Employment Promotion Projects Corporation is a special juridical person which has been established for the purpose of promoting the employment of workers.

Vocational Training Conducted by a City, Town, Village, etc.

11. Besides the foregoing, in case vocational training is provided, subject to the approval by the Minister of Labour, by a city, town or village, a public utility association, a trade union which is a juridical person or any other juridical person not having for its object the acquisition of gain, such training will be regarded as public vocational training.

12. Public vocational training is to be conducted in conformity with the standards laid down by the Ordinance of the Ministry of Labour, concerning the curriculum, training period, equipment and other matters, and the vocational training instructor in the public vocational training except training of vocational training instructors must be a person who has been granted the license from the Minister of Labour.

13. As to the training trades of the public vocational training the standards of which are prescribed for by the Ministry of Labour Ordinance, the training trades for basic skills amount to 84 and the trades for special skills to 31. By the Ordinance, training period, subjects of curriculum, training hours and equipments necessary for training (by trade), and number of trainees of a unit, number of training instructors and examination (for all trades) are prescribed.

Training Period

14. The training period for basic skills is one year or less (training hours: 1,800, 900 or 450 hours), and the training period for special skills is 2 years (training hours: 3,600 hours).

Curriculum

15. The subject of curriculum is divided into theory and practice. The former consists of general subject and special subject and the latter consists of basic practice and applied practice. General subjects are selected from among social study, gymnastics, mathematics, physics, chemistry, foreign language, Japanese and business administration so that a trainee may develop himself and learn the basis of the special subject. Special subjects are prescribed by trade so that a trainee may get the knowledge necessary for practice and develop the thinking power for the work. Practice is carried out from basic practice to applied systematically by steps.

Equipment

16. Equipment necessary for training is prescribed by training trade, under the headings of buildings and other construction, machinery and other equipments.

Number of Trainees of a Unit

17. The number of trainees of a unit is fixed from 30 to 50 so that training may be effectively conducted.

Number of Vocational Training Instructors

18. In principle, three training instructors are necessary for every 30 trainees, and four instructors for every 50 trainees. The number can be increased or decreased in accordance with the number of trainees, degree of danger involved in the training and difficulty of instruction.

Examination

19. Examination must be given once or more time by the subject of curriculum.

20. The vocational training instructors of the public vocational training must be those who have obtained a license from the Minister of Labour. The license will be granted to those who passed the examination for vocational training instructors, those who passed the first grade trade-skill test and subsequently completed the prescribed course of training, those who completed a course of the Central Vocational Training Centre (training period is four years), those who graduated from a college or those who have equivalent or better qualification.

21. With respect to the relief measures, public vocational training for basic skills given to applicants for employment and physically handicapped persons is free of charge and an allowance is paid to the handicapped.

22. Furthermore, the duration of benefit of the Unemployment Insurance is extended to a maximum of one year beyond the normal duration, if a trainee receiving unemployment benefits is undergoing public vocational training. thus making it easy to receive vocational training for the unemployed. Vocational Training Allowance and Separation Allowance are paid to trainees who are undergoing public vocational training by the instruction of the Public Employment Security Office and they are provided accommodation by the Employment Promotion Projects Corporation.

III SITUATION OF THE VOCATIONAL TRAINING ACTIVITIES

23. The situation of the public vocational training in 1962 is as follows.

Number of Facilities and Trainees

24. While the ordinary Vocational Training Centre is established and operated by the Prefectural Government, the General Vocational Training Centre and the Central Vocational Training Centre are established and operated by the Employment Promotion Projects Corporation and the Vocational Training Centre for the Physically Handicapped by the State and the Prefectural Government. The basic program concerning the provision of vocational training can be formulated by the Minister of Labour. In formulating the above program, consideration must be given so that skilled workers may be fostered properly in the light of the condition of employment and unemployment as well as the development in the manufacturing and other industries. Taking into account the lack of skilled workers, 2 ordinary Vocational Training Centres and 2 General Vocational Training Centres were newly built in 1962. As a whole 63,660 persons are being trained in 348 centres. The State budget necessary for the training amounts to 3,459,249,000 yen. The activities of the vocational training centres are as shown in the following table.

TABLE I

Type of training Centre	No. of facilities	No. of training trade	No. of trainees per term	No. of trainees yearly total	State budget
	centres		person		in thousand yen
Ordinary V.T.C.	295	944	33,565	44,880	1,093,997
G.V.T.C.	44	365	15,040	17,380	2,011,785
C.V.T.C.	1	11	190	220	163,446
V.T.C.for the Physically Handicapped	8	62	1,180	1,180	190,021
Total	348	1,382	49,975	63,660	3,459,249

25. Approved Vocational Training regarded as public vocational training is being given as shown in the following table for 1962.

TABLE II

The body which has established approved V.T.	No. of facilities	No. of training trade	No. of trainees
	centres		
City	3	7	1,110
Trade Union	1	2	180
Total	4	9	1,290

Training Trade

26. The vocational training of 84 training trades is being given in the ordinary Vocational Training Centres. The trades are classified into 4 kinds; industrial trades (mechanic, finisher, automotive mechanic, etc.), handicraft trades (wood worker, furnisher, carpenter, etc.), trades for women (dressmaker, typist, etc.) and trades of local industry (mason, pottery-worker). The trades for which many trainees are being trained are as follows; mechanic, welder, lineman (light and power), electric machine and instrument repairman, dressmaker, automotive mechanic, block layer, carpenter, wood worker, accountant, etc.

27. The number of training trades of General Vocational Training Centres are 34 and they are related to the secondary industries. The prevalent trades are as follows; mechanic, sheet metal worker, welder, lineman (light and power), electric machine and instrument repairman, automotive mechanic, etc.

28. As the adaptable trades to the physically handicapped persons, the training of watch repairman, radio and television repairman, dressmaker, mechanical draftman, barber, etc. are conducted in the Vocational Training Centre for Physically Handicapped Persons.

The Situation of Application and Employment

29. The situation of the application, entrance, completion and employment in the public vocational training in 1960 was as shown in the following table.

TABLE III

Type of V.T.C.	Ratio of applications (1)	Ratio of entrance (2)	Ratio of completion (3)	Ratio of employment (4)
	%	%	%	%
Ordinary V.T.C.	199	99	92	97
G.V.T.C. basic skills(5)	221	99	90	96
G.V.T.C. special skills	377	106	-	-
V.T.C. for the physically handicapped	132	95	91	94
C.V.T.C.	not operated			

Notes (1) Ratio of application = $\frac{\text{Number of applicants}}{\text{fixed number}} \times 100$

(2) Ratio of entrance = $\frac{\text{No. of admitted persons}}{\text{fixed number}} \times 100$

(3) Ratio of completion = $\frac{\text{No. of those who completed}}{\text{Number of trainees}} \times 100$

(4) Ratio of employment = $\frac{\text{Number of the employed}}{\text{No. of those who completed}} \times 100$

(5) The course of vocational training for basic skills commissioned by the Prefectural Government.

IV THE ROLE OF THE PUBLIC VOCATIONAL TRAINING

30. As the public vocational training is expanding its scale year by year, the number of those who complete the course of the public vocational training is also increasing every year.

31. As to the employment situation of those who completed the ordinary Vocational Training Centre, a pivot of the public vocational training in the fiscal 1958, 94.2% of those who completed the course found work, of whom 91.7% were employed by others. 62.6% of the employed ex-trainees found their employment in the small-scale undertakings employing 99 workers or less and only 19.7% of the employed ex-trainees were working in the undertakings with 500 workers or more.

32. With respect to the kinds of industry, 46.8% of the employed ex-trainees found their employment in manufacturing and 15.1% in Construction. Manufacturing and construction are the leading industries for the growth of the national economy. Further, as it is difficult for small-scale enterprises to train necessary skilled workers for themselves, it is no exaggeration to say that the public vocational training cooperating with

Other considerations

38. If an IPS is carried out upon request of the management of a firm it is advisable to charge a fee, preferably a lump sum; this could be a nominal one if the investigating organization is subsidized. If the enterprise has to pay for the service rendered co-operation of the firm might be obtained more fully. Complete co-operation on all levels is a conditio sine qua non.

39. Another consideration is the complete neutrality of the investigating body towards all other organizations or advisers who might be recommended for rendering expert assistance. If the surveying organization itself is also prepared to render further assistance, other possibilities for obtaining expert advice will also have to be mentioned, or it will have to be stipulated beforehand that the IPS has to be considered as a preliminary study for a subsequent consultancy assignment.

INTEGRATED PLANT SURVEY IN DEVELOPING COUNTRIES

40. It is recommended to have IPS applied by extension services in order to obtain preliminary studies, by industrial banks for facilitating their evaluation of loan applications etc. In this way the difficulty may be overcome that no requests are received from managers of small industries on account of their resistance to any outside assistance.

41. The experience of the Research Institute for Management Science (RVB) in the Netherlands has shown that an IPS was requested inter alia for one or more of the following reasons:

- management was convinced of having a well organized plant and wanted to have this checked;
- management wanted an outside report in order to strengthen its position toward its board or bankers;
- management felt that there existed in the plant certain problems without being able to define them accurately.

42. Before starting an IPS it is necessary to provide the investigating organization with a complete documentation regarding available expert assistance (consultancy, research, information, training) in the respective area. Eventually, if such documentation does not exist, a survey has to be undertaken in order to gather all facts about activities, limitations, costs, duration of assistance etc. of the organizations or bodies rendering such assistance.

43. IPS investigators have to be trained; such investigators need:

- good theoretical knowledge of the different management techniques in the various fields of management and familiarity with their application as well as their limitations;
- sufficient practical experience in applying such knowledge in industrial enterprises;
- good understanding of managerial problems in industry;
- not a purely scientific but above all a practical approach:
- a confidence-inspiring personality.

44. As IPS covers the industrial enterprise as a whole, it might be advisable - if circumstances permit - to have it carried out by a team of two investigators: production and personnel sectors by an industrial engineer, marketing and financing by an industrial economist.

45. It is recommended that the investigator has acquired previous experience in management consultancy work. Before starting his activities as investigator it is advisable to have such an official carry out some surveys under the guidance and supervision of an experienced investigator. Good training may also be achieved by having the trainee-investigator follow up himself one or more of the surveys.

46. In general it will not be a practical proposition to establish a special organization occupying itself exclusively with IPS. Such surveys can

vocational training within industry contributes to the fostering of skilled workers who are the support and driving force of the economic development of our country.

33. With the progress of technological innovation, the shortage of skilled workers is becoming more acute a problem. According to the survey conducted in 1962, the shortage of skilled workers amounts to about 1,260,000 persons. On the other hand, there are many who need to undergo vocational training for employment, for instance, persons who have been displaced from the coal mining and who have left the agriculture, etc. In providing a greater security of employment by giving skills to them, the role to be played by the public vocational training is very significant.

34. At present, about 27% of the trainees of public vocational training in the ordinary Vocational Training Centres and General Vocational Training Centres are unemployed persons and those who have left the agriculture, etc. Especially, for those who have been displaced from the coal mining and U.S.Army Base, special measures are being taken with respect to the training.

35. As mentioned above, the duration of benefit of the Unemployment Insurance is extended to a maximum of one year beyond the normal duration, if a trainee receiving unemployment benefits is undergoing public vocational training. Vocational training allowance is given to those who are not entitled to the unemployment benefit and other benefits are allowed to the trainees. The public vocational training has contributed to the economic development of our country by its two functions; to foster and secure skilled workers necessary to the small- and medium-scale enterprises, for which it is difficult to foster skilled workers for themselves, by cooperating with vocational training within industry, and to assure the security of employment and promote the mobility of labour by endowing skills to unemployed persons who lost their jobs on account of the technological innovation or the change of industrial structure.

V THE PROBLEMS OF PUBLIC VOCATIONAL TRAINING

36. In order to solve the problem of shortage of the skilled workers at present and in response to an increasing demand for skilled workers following the economic growth in the future, the vocational training must be expanded and strengthened.

37. For this purpose, a Long-term Program of Vocational Training was formulated in 1960. According to this program, the number of trainees of the public vocational training in 1970 will be 137,000 (2.4 times the number of 1965). In the ocurse of the execution of this program, the following problems will come into existence.

Operational

A. Securing of Capable Vocational Instructors and Raising of Their Quality

38. The result of vocational training depends upon the ability and quality of training instructors. With the shortage of engineers, it will be difficult to secure the necessary and capable vocational instructors of the public vocational training. Since the training instructors must be able in theory and practice, the difficulties will be doubled. Even if the facilities for

best be handled by organizations destined to promote efficiency in other ways too, for instance providing training possibilities as well as documentation and information services.

47. The number of surveys to be handled by one investigator or by a team will depend largely on experience, geographical distribution of enterprises as well as their size, routine acquired by numerous surveys in certain branches of industry and the facilities at the disposal of investigators.

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training of training instructors (for example, the Central Vocational Training Centre) should be established, it would be difficult to estimate the number to become training instructors.

B. Setting of Reasonable Standards of Training

39. In order to keep abreast of continuous progress of production techniques, it is absolutely necessary to decide clearly the range of the skills to be trained and set the reasonable standards of training.

C. Augmentation of Training Facilities and Equipment and Training Materials Necessary to Carry Out Vocational Training Effectively

40. It is necessary for carrying out vocational training effectively to augment the training facilities and equipment and training materials. But it will be difficult to materialize such plans with limited budget.

Institutional

A. Relationship between the Public Vocational Training and the School Education

41. Vocational training based on the Vocational Training Law must be provided under the close coordination with school education under the School Education Law, avoiding the overlapping with the school education. However, the certification of completing the course of school is not allowed to those who complete the course of the public vocational training.

42. In order to extend the public vocational training to young persons, it is necessary to cooperate with school education authority or alternatively to establish a system with a view to elevating the social status of skilled workers. At present, it is now being examined how to locate the vocational training under the Vocational Training Law and other training in the system of senior secondary education.

B. Means of Assisting the Trainees in their Maintenance during the Training Period

43. With the expansion of the vocational training for the unemployed -- that is one of the important functions of the public vocational training -- consideration must be taken into the need of providing better means of assisting the trainees in their maintenance during the training period, especially for the middle-aged trainees who must support their families.

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Agenda Item: B.3. Netherlands

INTEGRATED PLANT SURVEY

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INTEGRATED PLANT SURVEY

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INTRODUCTION

1. Integrated Plant Survey (IPS) may be defined as the evaluation of existing conditions in a small industrial enterprise, indicating its weak as well as its strong points. As within the scope of this paper the application of IPS is primarily directed towards small enterprises, a definition of small-scale industry seems indicated.

2. A small industrial enterprise is a manufacturing unit, also including repairs and services, the manager of which performs personally all important managerial functions and is moreover in daily contact with the workers, without taking himself an active part in the workers' tasks; such enterprises are not in the position to employ specialists on a permanent basis, in contrast with medium-sized and big industries, which are able to follow closely developments in the field of technology and scientific management by having at their disposal, either temporarily or permanently, specialist-staffmembers in the various fields.

3. In the process of industrialization small industry plays an important role in any country and of course a much more important one in newly developing countries.

Importance of Integrated Plant Survey for Small-scale Industry

4. It is of paramount importance that small industry too be in a position to profit by new developments in technology and scientific management. This can be achieved either by indicating to them in which fields introduction of scientific management is possible, by pointing out additional training possibilities for all levels of management and in general by overcoming objections against making use of expert assistance.

5. Before a small industrialist, however, will be able to take any decisions in the afore-mentioned fields, it will be necessary:
- to analyse and define correctly the problems existing in the enterprise, and
- to arrange the existing problems in the sequence of relative priority.

6. Experience has shown that managers of small enterprises are usually taken up by their daily tasks to such a degree that there is no time available for studying, classifying and solving all kinds of problems. The following observations made in a great number of small industries in the Netherlands may be taken as an additional indication why in many cases some outside assistance appears necessary:
. managers of small industries are often unable to gain a clear insight into their future requirements;
. in many cases managers simply do not want to face their own problems ("there are none so blind as those who will not see");
. managers have insufficient knowledge of existing and new techniques and new developments in general;
managers often evaluate their own position incorrectly;

. management is inclined to disguise certain facts, either intentionally or unconsciously;
. for small industrialists existing problems are often too complex and interlocked.

7. The foregoing elucidates in the author's opinion the need for and importance of IPS as a form of assistance to small industry.

8. The objectives of Integrated Plant Survey are:
. to make a diagnosis of the actual position indicating weak as well as strong points of the enterprise;
. to define correctly the existing problems and to indicate their relative priority;
. to indicate which problems and/or shortcomings can be overcome by the firm's own staff, either directly or with some outside assistance (e.g. training of some staffmembers), and which problems will require outside expert assistance within the scope of the firm's financial resources;
. to overcome objections against making use of expert assistance.

9. In this way a round development of small industries will be furthered by enabling management to consider its future medium-term policy.

A comparison of Integrated Plant Survey with a medical check-up

10. will serve to elucidate the actual meaning of the former. A human being may present itself to a medical board either because it feels unwell or for a general medical check-up (integrated survey). The medical board will either establish some living rules (action to be taken by the firm itself) or, in more serious cases, will refer the person to his family physician and/or to a specialist (outside expert assistance). Although a human being might consider itself quite healthy, some hidden illness (intentional or unconscious disguising) may be detected e.g. stomach trouble caused by bad teeth (complexity and interlocking of problems).

Application

11. IPS can be carried out by various organizations. The small entrepreneur will have to take the initiative by asking for such a survey to be made or certain special organizations may draw the industrialist's attention to this specific form of outside assistance.

12. Such an organization could be for instance an existing extension service for small-scale industry; even if the extension worker should be called in by the entrepreneur for the investigation of a special problem, it may be advisable that the extension worker starts with making an IPS, in order to place this special problem within the frame of the whole enterprise and to decide then whether this specific problem really is the most important one for the firm.

13. Other bodies which might handle IPS to their advantage are the industrial banks; especially in newly developing countries these banks are broadening their activities on behalf of small industry by setting up management consultancy departments. If small industries are applying for a loan, the bank will be enabled to judge more accurately the merits of such an application and the safety of the loan eventually to be granted by executing or having executed an IPS; by the results of such a survey the bank can at the same time provide the applicant with a combination of technical information (e.g. utilization of existing machinery) and information on commercial (e.g. marketing) and financial matters (e.g. influence of increased or improved production on profits and adaptation of the term of a loan and the rate of repayments to the situation of the enterprise).

14. An IPS might also be carried out upon the request of governmental bodies such as import licence offices. Applications for import licences for

machinery and/or raw materials can be judged in a much better way by conducting an IPS; thus reliable information can be obtained whether the existing machine capacity is fully utilized, the goods to be produced are really saleable on the market, the required skill to perform the necessary work is available and whether the management is capable of running the enterprise in an efficient way.

15. If IPS is applied in a great number of enterprises the needs of the industry in a certain region and/or in certain industrial branches might be determined and quantified, which will prove very useful in establishing long-term governmental industrialization policy in developing countries. Determination of specific needs of a branch of industry (e.g. training) as sole objective can of course be arrived at by a more simple industrial survey.

16. A large number of IPS executed in the same branch of industry must not be confused with "interfirm comparison"; in the latter case the objective is to collect pertinent data of a large number of firms in the same branch of industry and by comparing these data to establish the relative position of each firm within the whole branch.

EXECUTION OF THE INTEGRATED PLANT SURVEY

17. The execution of IPS comprises the following successive steps: observation, evaluation and reporting.

Observation

18. The observation consists of the recording of the actual position of the enterprise. The investigator has to record all the characteristic data of the enterprise as a whole, covering all its sectors (production, marketing, financing and personnel). In general it will be sufficient to record only rough data; only if symptoms and recordings indicate potential bottlenecks, a further and more detailed study will be required. Existing recording techniques of scientific management such as time study, worksampling, lay-out and routing, market covering analysis etc. are applied.

19. In the production sector a distinction has to be made between firms producing only one type of product ("line production"), enterprises with a production programme of similar products ("process flow production") and "single piece production", including repairs and service; combinations of these three types of industries will of course occur.

20. In the first and second type of industry the main points to be checked are whether workstations are situated in the right sequence of operations and whether the different capacities of workstations are adequately balanced. Moreover, attention should be paid to a continuous flow of material, prevention of machine breakdowns and minimizing change-overs of jobs of operators.

21. In the third type of industry (single piece production) the points to be stressed are the ratio "direct work - indirect work" and the time utilisation of individual workers and machines.

22. In all enterprises attention has to be paid to quality aspects, while it has to be ascertained whether the right type of cost calculation is used. In "batch-" and "mass-production" the cost calculation system in use must provide the opportunity to check the profitability per type of product, while in single piece production the profitability calculation per order must be possible.

23. In the marketing sector a different approach will have to be used for producers of "industrial goods" or "consumer goods". Regarding industrial goods some of the items to be recorded are: analysis of regular customers, knowledge about potential buyers, delivery times, etc. In the case of consumer goods moreover special attention will have to be paid to route planning for the salesmen, visiting frequencies, costs per visit, market covering.

24. It has to be ascertained whether sufficient attention is being paid to

the importance of small versus big orders from the costprice point of view, both in the production and marketing sector.

25. In the financial sector the main data to be recorded and studied are balance sheets and profit and loss accounts, preferably over the last three consecutive years. The liquidity position of the firm has also to be looked into.

26. In the personnel sector organization charts have to be drawn up as well as turnover diagrams and instruction-time-tables, etc.

27. For practical reasons the actual survey has to be done in as short a time as possible, in connection with the presumably limited availability of investigators, and the costs per survey. Experience in the Netherlands has shown that the actual observations in the factory can be limited to 2 - 3 man-days. The following measures can be taken in order to speed up the investigation proper and to decrease the costs of the whole survey:

- to request the firm to provide already before the actual investigation all data already available such as balance sheets with profit and loss accounts, list of personnel, data regarding machinery and equipment, eventually lay-out and details regarding sales.
- to instruct the personnel of the enterprise to prepare certain data in a specifically indicated way; such instructions followed by an explanation about the interpretation of the data gained in this way constitute a complementary training for the firm's personnel, so that the firm itself, after completion of the survey, will be able to continue to make such recordings and to analyse the respective findings.

Evaluation

28. From the findings in the different sectors of the enterprise as well as from the administrative and informative procedures observed conclusions have to be drawn. The conclusions are made for the various items of each sector.

29. It may happen that certain symptoms observed in one sector indicate an undesirable situation in another sector. Observations may for instance show that a machine is not fully utilized; the reason may be:

. idle time because materials are not available at the appropriate time (faulty purchasing policy, deficient inventory control);
. an unsufficient number of workers is available (personnel planning);
. unsufficient stock of orders (marketing);
. "down time" because of bad maintenance (production);
. overcapacity in order to maintain a flexible set-up of the firm (in case of repair and service enterprises).

In all aforementioned cases, with exception of the last one, the symptom of underutilization indicates a deficiency, while in the last case this underutilization may very well constitute a strong point of the firm.

30. The integrated final evaluation is obtained by combining the findings of each sector. The following rating is applied for each item:

"improvement necessary": immediate attention is considered urgent;
"improvement desirable": improvements are expected to result in cost savings, increase of production or other tangible results;
"reasonable": due to prevailing circumstances improvements cannot be expected to lead immediately to tangible results;
"satisfactory": the strong points of the enterprise; regular attention to these points is recommended.

These ratings indicate the priority of actions to be undertaken.

31. "Improvement necessary": neglecting the points under this heading will result within a relatively short period to a dangerous situation regarding the profitability and even the continuity of the firm.

In the Netherlands such points concern mostly financial (liquidity, too much

short and lack of sufficient own capital and long-term loans etc.) and marketing aspects (high costs of small orders, decrease of market-share in a growing market etc.).

32. "Improvement desirable": this rating comprises the items, the strengthening of which by appropriate action according to calculations and reasonable expectations will entail expenditure inferior to expected results. These aspects mostly concern production (improvement of lay-out and working methods) and marketing (improvement of selling procedures, market covering analysis).

33. "Reasonable": the estimated expenditure for improvement would at present exceed the results. Action does not seem indicated at present. Typical examples in this respect are encountered in the personnel sector (recruitment and selection procedures) and to a lesser extent in other sectors (e.g. statistical quality control can only be initiated with the assistance of a quality expert, which is not feasible for small enterprises).

34. "Satisfactory": mentioning the strong points of the firm is advisable for psychological reasons (moral support by not only mentioning deficiencies and weak points); on the other hand continuous attention has to be given to these points in order to strengthen them. These items sometimes constitute the real "selling points" of the firm (e.g. short delivery times in a repair shop).

Reporting

35. The drawing up of a report to be submitted to management of a small enterprise requires careful attention. In order to be readable and understandable the report has to be concise, so that it can be read in about 15 minutes. The wording has to be simple and clear and specific scientific terminology has to be avoided. It is therefore recommended to limit the report itself, containing the overall conclusions, to 3 - 5 pages of typescript and to present a summary of these conclusions in an evaluation diagram; a part of such a diagram is shown below:

Figure I

Sector	Item	A	B	C	D
Production	Machine utilization		▨		
	Quality aspects			▨	
	Production system and lay-out		▨		
	Cost calculation system	▩			
Marketing	Sales method			▨	
	Profitability of orders				▩

A = improvement necessary
B = improvement desirable
C = reasonable
D = satisfactory

36. The arguments sustaining the conclusions are presented per sector in annexes, each of which not exceeding 3 pages. The annexes have to be self-explanatory, so that the management is enabled to transmit specific annexes to the functionaries concerned without having to make them acquainted with the contents of the overall report.
A list of names and addresses of outside experts, research information centres and to pertinent literature may be attached to the report.

37. After a suitable interval the report is discussed with the management in order to give orally additional information and clarification and to make sure that report and conclusions are understood and correctly interpreted.

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CONFÉRENCE DES NATIONS UNIES
SUR L'APPLICATION DE LA SCIENCE ET DE LA TECHNIQUE
DANS L'INTÉRÊT DES RÉGIONS PEU DÉVELOPPÉES

Point de l'ordre du jour : B.5.1

Cameroun

SECURITE ET HYGIENE DU TRAVAIL

Par le Médecin J. BOWEN,
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au Secrétariat d'Etat au travail
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Les mémoires rédigés à l'intention de la Conférence des Nations Unies sur l'application de la science et de la technique dans l'intérêt des régions peu développées sont des documents de travail. Ils sont publiés tels qu'ils ont été présentés et les assertions et opinions qu'ils contiennent sont celles de leurs auteurs.

NOTES

1. Les mémoires choisis pour être présentés en séance générale pourront être obtenus à la Conférence dans les langues officielles suivantes des Nations Unies: anglais, espagnol, français et russe.

2. Les mémoires choisis pour être présentés en séance spéciale pourront être obtenus à la Conférence dans l'une seulement de ces langues officielles.

3. Les résumés qui ont été rédigés pour tous les mémoires par les auteurs de ceux-ci pourront être obtenus à la Conférence dans les langues officielles suivantes des Nations Unies: anglais, espagnol, français et russe.

4. Préalablement à la Conférence, les mémoires et les résumés ne feront pas l'objet d'une distribution générale mais d'un tirage restreint destiné aux délégations des gouvernements et autres participants officiels. La publication et la distribution générale des actes de la Conférence s'effectueront conformément aux règles et pratiques agréées par le Comité des publications des Nations Unies.

SECURITE ET HYGIENE DU TRAVAIL

par le Médecin J. BOWEN, diplômé de Médecine du travail, médecin-inspecteur du travail, chef du Service de l'inspection médicale du travail et de la main-d'oeuvre au Secrétariat d'Etat au travail et aux lois sociales, Yaoundé

GENERALITES :

La République Fédérale du Cameroun compte 4,035 millions d'habitants trés inégalement répartis sur une superficie de 529.000 km2. Le présent mémoire se limite à l'Etat Fédéré du Cameroun Oriental dont la population est de 3.500.000 habitants pour une superficie de 432.000 km2, avec une densité moyenne de 7,9 au kilomètre carré. Cette population est constituée d'un ensemble de clans, de tribus, et de races parlant une multitudes de dialectes mais vivant en harmonie. Aussi diversifiés que les dialectes, les coutumes présentent toujours un trait commun. Les Camerounais sont catholiques, protestants, musulmans ou païens. Ils aiment cette vie communautaire spéciale aux Africains. Ils vivent essentiellement des ressources agricoles. Travailleurs dans l'ensemble ils s'efforcent de tirer du sol parfois ingrat, le maximum de rendement avec des moyens trés limités. Cependant de trés vastes étendues de terrains restent encore inexploitées parce que propriété de tel ou tel individu. Ici se pose un problème crucial : celui de la réforme agraire.

Avec l'industrialisation du pays, l'économie basée jusqu'ici sur l'agriculture, tend petit à petit vers une économie fondée sur le salariat. On compte en moyenne 120.000 Salariés dans le public et le privé, sortant soit de l'école soit directement de la campagne, avec une psychologie propre et un mode de vie particulier à chacun de ces milieux. Ce n'est donc pas sans heurts que nos populations franchissent ce passage. En effet, dans les campagnes on se contente de peu et vit dans une heureuse insouciance. Transplaté en ville ou dans une usine, ce jeune quittant le banc de l'école ou l'émigrant du village doit désormais mener une vie disciplinée, se lever tôt et se coucher tard, penser, prévoir et prendre seul ses responsabilités, faire face aux" brimades des anciens", bref s'adapter aux impératifs de la vie moderne. Cette adaptation se fera avec divers risques pour la santé physique et mentale du jeune travailleur. Le vieil ouvrier ne sera pas moins exposé aux difficultés professionnelles; il a pris des habitudes qu'il changera difficilement devant les exigences des techniques nouvelles. Dès lors, la protection du travailleur devient une nécessité impérieuse, d'autant plus que l'industrialisation du pays est en constante progression. En effet, en dehors de l'agriculture qui constitue la base de l'économie camerounaise (produits vivriers, production et préparation des produits d'exportation : usines d'égrenage du coton, de décorticage de l'arachide et du café, de fabrique d'huile de palme) de nombreuses réalisations ont été faites sur le plan industriel : exploitations forestières (coupe de bois et scieries), élevage, énergie hydraulique, centrales thermiques, industries de transformation et chimiques, pour ne citer que celles-là.

Ces différentes branches professionnelles comportant des dangers communs ou particuliers au genre d'activité exercée, auxquels il convient d'ajouter ceux inhérent à la transplantation, à la vie en société, à l'insuffisance de l'équipement sanitaire et scolaire, à la malnutrition et l'habitat, sans négliger l'influence du climat et des grandes endémies tropicales. IL faut non seulement soigner l'homme devenu malade du fait de son travail mais l'empêcher par la vulgarisation des mesures d'hygiène et de sécurité, de le devenir.

TEXTES LEGISLATIFS EN VIGUEUR AU CAMEROUN ORIENTAL :

La législation Camerounaise sur la sécurité et l'hygiène du travail, est basée sur l'expérience acquise dans d'autres pays, en particulier en France. Elle date de dix ans environ et bien que strictement observée dans quelques grosses entreprises, elle est presque méconnue dans les moyennes et surtout les petites entreprises du pays. Il va s'en dire que sa pratique est fonction du nombre et de la conscience professionnelle du personnel de contrôle.

Le chapitre 1er du Titre VI de la Loi du 15 décembre 1952 traite de l'hygiène et sécurité. Plusieurs arrêtés d'application ont été pris ; l'arrêté n°3323 du 28/6/1954 modifié par le n°3378 du 3/6/1955 constitue le texte fondamental. Son action s'étend sur tous les établissements industriels et commerciaux quelle que soit leur nature, publics ou privés, même lorsque ces établissements ont un caractère d'enseignement professionnel ou de bienfaisance, les offices publics ou ministériels, les professions libérales, les syndicats, les sociétés civiles et associations, les établissements où ne sont employés que les membres de la famille, sous l'autorité soit du père, soit de la mère, soit du tuteur.

Les dispositions relatives à l'hygiène des travailleurs ont trait :

- au nettoyage des locaux de travail, qui doit se faire avant l'ouverture ou après la clôture; le balayage à sec étant formellement interdit;
- à l'aération et à l'éclairage; le cubage d'air varie de 7 à 10 mètres cubes dans les locaux fermés affectés au travail;
- à la protection contre les émanations diverses; les poussières ainsi que les gaz incommodes, insalubres ou toxiques, sont captés à la source et évacués au dehors des locaux de travail; l'inspecteur du travail peut donner l'autorisation de prendre les repas dans les locaux de travail; l'introduction et la consommation des boissons alcoolisées sont interdites.

- Aux vestiaires avec douches et lavabos pour les travaux salissants .

- Auxlieuxd'aisance et au siège.

Les principales dispositions relatives à la sécurité des travailleurs fixent :

- les mesures générales de protection contre les dangers provenant de l'outillage mécanique. Le passage entre les machines doit avoir une largeur de 80 centimètres au moins; le sol ne doit pas être glissant. Toutes les parties dangereuses des machines doivent être munies de dispositifs de protection. Il est interdit de procéder au nettoyage et au graissage des machines en marche.

Les vêtements des ouvriers seront ajustés et non flottants.

- Les mesures de protection contre les dangers provenant des appareils de levage; il est interdit de porter des charges au-dessus du personnel, de transporter des personnes avec des appareils de levage. On vérifiera au moins deux fois par an le bon état et fonctionnement de ces appareils
- Les mesures de protection contre les risques d'incendie : le nombre, dimensions et disposition des issues et escaliers. L'éclairage est réglementé et des consignes pour les cas d'incendie sont affichées dans tous établissements occupant au moins 50 personnes.
- Les mesures de protection relatives au transport des travailleurs à l'intérieur et à l'extérieur des établissements ou exploitations.
- Les moyens de contrôle et de mises en demeure, assurés par les Inspecteurs du travail. Les infractions sont passibles de sanctions pénales.

Dans les mines, les minières, les carrières, les fabriques et dépôts de substances explosives et de matières dangereuses, les mesures de protection sont fixées par une réglementation spéciale dont le contrôle est assuré par un service technique dont les fonctionnaires disposent à cet effet et dans cette limite des pouvoirs des inspecteurs du travail. (Arrêté 3338 du 3 Juin 1955 pris conformément à l'art. 158 de la Loi du 15 décembre 1952.)

D'autres considérations sur la sécurité et l'hygiène du travail proviennent des arrêtés particuliers à certaines professions présentant un risque spécial. C'est le cas de :

- L'arrêté 6676 du 5 Octobre 1955 réglementant l'emploi dans la peinture de la céruse et des composés de plomb dans les cas où cet emploi reste autorisé. Il est notamment interdit d'employer les jeunes gens de moins de 18 ans et les femmes aux travaux comportant l'usage de ces produits. Le grattage et le ponçage à sec sont interdits; les armoires-vestiaires obligatoires. Une attestation médicale d'aptitude établie après examen clinique et au besoin hématologique, renouvelée deux mois après l'embauche puis tous les six mois au moins, doit être délivrée à tout ouvrier devant effectuer des travaux exposant au saturnisme. Un avis indiquant les dangers du saturnisme et les moyens de prévention est publié en annexe au présent arrêté; les chefs d'établissements sont tenus de l'afficher dans un endroit apparent des locaux de travail.

Les inspecteurs du travail et les médecins inspecteurs du travail contrôlent l'exécution de cet arrêté et des sanctions sont prévues contre toutes infractions.

- L'arrêté n°6677 du 5 Octobre 1956 fixant les mesures particulières d'hygiène et de sécurité applicables dans les établissements dont le personnel est exposé à l'intoxication benzolique. Le titre premier donne la liste des travaux exposant au benzolisme. La surveillance médicale forme le titre deuxième. Une attestation médicale est délivrée aux travailleurs dans les mêmes conditions que pour la prévention du saturnisme, avec cette différence qu'ici l'examen hématologique laissé plus haut à l'appréciation du médecin, devient obligatoire. Il est prévu un registre spécial tenu à la disposition des inspecteurs du travail et des médecins inspecteurs, mentionnant pour chaque travailleur : les dates et durées d'absence pour cause maladie; les dates des certificats justifiant ces absences et le nom du médecin qui les a délivrés; les attestations médicales établies par le médecin de l'établissement. LE Médecin inspecteur du travail peut prendre connaissance des resultats des examens hématologiques conservés par le Médecin. Le non et l'adresse du médecin chargé de procéder aux examens, sont affichés dans un endroit des locaux de travail, ainsi que l'avis relatif aux dangers du benzolisme et les mesures de prévention, annexé au présent arrêté. L'annexe publie également des" recommandations aux médecins"que l'employeur doit remettre au médecin chargé de procéder aux examens. Les différents cas d'inaptitude y sont envisagés.

L'emploi du benzène et de tous mélanges d'hydrocarbures benzèniques distillant avant 100° est interdit. Les recipients contenant des hydrocarbures benzèniques ou des produits en renfermant, doivent être étiquetés. Le titre quatrième du présent arrêté fixe la couleur et les dimensions des étiquettes. Les inspecteurs du travail assurent le contrôle et constatent les infractions.

La prévention comprend les visites médicales périodiques et les mesures techniques de protection. Les vapeurs nocives seront captées per descensum à leur lieu de production et évacuées. La teneur du benzol dans l'atmosphère du local doit être de l'ordre de 0 gi par mètre cube, grâce à de bons dispositifs de ventilation générale de l'atelier et d'aspiration localisée aux

sources d'émission du toxique. Les masques avec cartouches filtrantes contribuent à la protection individuelle.

Les recommandations aux médecins dont nous avons parlé plus haut font mention des divers cas où l'inaptitude peut être prononcée.

- L'arrêté n° 6679 du 5 Octobre 1962 concernant la protection du personnel exposé aux rayons x et au rayonnement du radium dans les hôpitaux, les cliniques, les dispensaires, les cabinets médicaux, les cabinets dentaires et radiologiques, dans les maisons de santé et les centres anticancéreux. Les chefs d'établissements, directeurs ou préposés sont tenus d'afficher sur les lieux du travail l'avis indiquant soit les dangers des rayons x et les précautions à prendre, soit l'avis indiquant les dangers du radium et les précautions à prendre, soit l'avis concernant les précautions à observer pour les examens radiologiques, selon qu'il s'agit des R x ou du radium.
La dose de tolérance admise dans l'air des établissements est fixée à 300 milliroent gen par semaine. Pour assurer la protection on a adopté les chiffres admis par le Comité international de protection, chiffres qui varient avec le voltage et les matériaux. L'arrêté 6679 précise également les normes des appareils et des installations à rayons x. La prévention médicale des accidents occasionnés par les rayons x et le radium comporte un examen clinique complet et un examen hématologique à l'embauche. Les examens périodiques ont lieu tous les six mois. Il doit exister dans chaque établissement où le personnel est exposé au rayonnement, un registre dans lequel sont consignés les resultats des examens du sang.

En outre l'arrêté n° 981 du 27 Février 1954 fixe les conditions du travail des femmes et de enfants. Il est notamment interdit d'employer ces derniers à des travaux excédant leurs forces. L'arrêté n° 982 du 27 Février 1954 pris conformément aux dispositions de l'article 118 du Code du travail Outre-Mer détermine les catégories des travaux interdits aux enfants. L'âge d'admission à l'emploi des enfants dans les entreprises du Cameroun Oriental est fixé à 14 ans, avec dérogation prévue par l'arrêté n° 983 du 27 Février 1954 pour les travaux domestiques et les travaux légers d'un caractère saisonnier.

La durée du travail est de 8 heures avec repos de une heure au moins. Les femmes enceintes ou allaitant leurs enfants jouissent d'un repos supplémentaire. A l'occasion de son accouchement, toute femme a le droit de suspendre son travail pendant quatorze semaines; en cas de maladie resultant de la grossesse ou des couches, ce délai est prolongé de trois semaines. L'accouchée qui reprend son travail ne doit porter, trainer ou pousser aucune charge dans les trois semaines qui suivent son retour à l'atelier.

Les enfants doivent être périodiquement examinés par le médecin de l'entreprise ou un médecin assermenté.- Les conventions internationales relatives à l'âge d'admission et au travail des femmes et des enfants, sont appliquées .

De plus, les questions relatives à la sécurité et à l'hygiène du travail sont étudiées par un Comité technique consultatif institué par l'arrêté 6312 du 22/12/1953 pris en application de l'article 133 de la Loi du 15/12/1952. Ce comité comprend l'inspecteur général du travail, le directeur de la Santé publique, le directeur des travaux publics, le directeur du service des mines, le directeur des chemins de fer, le médecin inspecteur du travail, des représentants des employeurs et des travailleurs en nombre égal.

En réalité ce comité n'a pas siègé depuis longtemps. Il est question de lui substituer un Conseil national du travail dans le nouveau Code du travail du Cameroun qui est actuellement à l'étude. La classification des établissements en établissements dangereux, insalubres et incommodes, fixée par l'arrêté n° 446 du 16 Juillet 1953, contribue à la vulgarisation de la prévention car elle fait connaître les risques des professions intéressées.

Enfin l'ordonnance 59/100 du 31 décembre 1959 a créé l'Institut de Prévention dont le fonctionnement est contrôlé par le Conseil Supérieur des accidents du travail et des maladies professionnelles. Elle a pour mission de vulgariser les méthodes de prévention, de faire des enquêtes permettant d'établir des statistiques des accidents du travail et des maladies professionnelleles, de favoriser par des subventions ou avances, l'enseignement de la prévention. Son arrêté d'application est encore à l'étude.

Malgré toutes ces mesures de prévention, on enregistre déjà prés de 4.000 accidents du travail chaque année au Cameroun Oriental; ils entraînent une incapacité de 50% et plus chez environ 110 blessés et causent une quarantaine de décés. J'ai eu l'occasion d'envisager leurs multiples causes dans mon rapport de conclusion adressé récemment au Bureau International du travail. Les maladies professionnelles existent certainement mais passent inaperçues à cause de l'insuffisance du contrôle. On a le devoir de prévenir ces accidents et maladies ou de réparer leurs effets. C'est pour répondre à cette nécessité que l'ordonnance 59/100 du 31 décembre 1959 a été prise. Elle régit, jusqu'à l'institution d'un régime général de sécurité Sociale, la réparation et la prévention des accidents du travail et des maladies professionnelles. En application de ses articles 22 à 29 inclus il a été publié par arrêté n° 005/TLS/SS du 9 mars dernier une liste de maladies professionnelles indemnisables au Cameroun Oriental, inspirée de la liste française. Nous y avons ajouté un 42ème Tableau relatif à la trypanosomiase.

DIFFICULTES QUE POSE L'APPLICATION DES MESURES DE SECURITE ET D'HYGIENE DU TRAVAIL AU CAMEROUN ORIENTAL :

1.- Pour L'EMPLOYEUR :

Etant donné l'importance relativement faible des entreprises existant actuellement dans le pays, certaines mesures techniques de protection sont difficilement réalisables. Par contre dans quelques unes qui disposent des moyens financiers suffisants, l'effort entrepris par le patron pour assurer la sécurité de ses employés se heurte à une négligence et une insouciance parfois révoltantes de la part de ces derniers. Combien de fois n'a-t-on pas rencontré des ouvriers travaillant sans protection bien que le nécessaire ait été mis à leur disposition (lunettes, jambières, masques, etc...). Il est évident que le patron joue parfois un rôle passif dans cette insouciance. J'entends par là qu'il ne prend pas la peine d'expliquer l'importance du dispositif de protection et d'informer ses ouvriers des risques auxquels ils s'exposent, mais se contente de déclarer à l'inspecteur du travail ou au médecin inspecteur en présentant quelques échantillons ; "J'ai tout ce qu'il faut. Ils prétendent que ça les gene." Ne profiterait-il pas ainsi de l'ignorance du travailleur pour apaiser certains soucis financiers? Les dispositifs qu'on utilise s'usent et demandent d'être remplacés. Il existe cependant des employeurs soucieux de la santé de leurs travailleurs. A ceux-ci nous rendons hommage.L'instabilité de la main-d'oeuvre, l'analphabétisme, certaines coutumes locales, la faiblesse de production, etc;.., entravent parfois considérablement leur action.

2. - POUR LE TRAVAILLEUR :
La soif de gain pousse le travailleur à négliger la protection; ceci s'explique du fait que nombre d'ouvriers sont payés à la tâche. Cependant nous sommes persuadés que l'ignorance du danger est à la base de cette négligence. En effet, lorsqu'on voit un ouvrier travailler sans masque dans le nuage de poussières nocives d'un poste de sablage ou d'une concasseuse (carrière de pierre) on ne peut attribuérune telle situation qu'à l'ignorance de ce mal inguérissable qu'est la silicose; il en est de même du peintre au pistolet, et nous pensons sincérement que s'il était informé, il préférerait certainement gagner peu et plus longtemps que beaucoup pour devenir, aprés cinq ou dix ans d'activité intense, inapte pour le reste de sa vie. L'éducation de l'ouvrier reste donc la condition sine qua non pour obtenir son adhésion au respect des mesures de sécurité et d'hygiène. Ceci est d'autant plus important que certaines habitudes regrettables prédisposant l'Africain aux dangers du travail; ainsi on voit parfois des ouvriers d'imprimerie, d'atelier de peinture, ou venant de manipuler par exemple des insecticides organophosphorés, etc... se précipiter sur un plat de nourriture sans se laver les mains ni rincer la bouche.

3. - POUR L'ETAT :

Comme tout jeune Etat, le Cameroun Oriental a ses possibilités financières limitées par la faiblesse de sa production. Conséquences : il n'a pas la possibilité de former qualitativement et quantitativement le personnel nécessaire au contrôle approfondi de l'application des mesures d'hygiène et de prévention , ni mettre à sa disposition tous les moyens d'action nécessaires.

COMMENT OBTENIR L'ADHESION DE TOUS ?
La Sécurité et l'hygiène du travail exige la collaboration de tous.

4. - LE TRAVAILLEUR
est le principal intéressé de la question. Il doit s'informer sur l'importance du risque, sur l'utilité des dispositifs de protection et des mesures d'hygiène. Il devra avoir une aspiration pour trouver goût au métier et travailler en communauté d'intérêt avec l'entreprise. L'employeur devra s'armer de courage et de patience pour éduquer ses ouvriers, pour leur faire prendre conscience de l'importance de la sécurité. Généralement plus favorisé, il doit pouvoir leur expliquer les causes de tel ou tel accident, sans pour autant les sous-estimer. Il lui faudra souvent le concours du médecin ou de l'infirmier d'entreprise pour les persuader. Il devra créer, autour de soi, ce climat de confiance qui réduit le nombre d'accident et contribue à la prospérité de l'entreprise. Il doit écouter les doléances, tolérer les mécontentements, admettre des pauses lorsque la fatigue se fait sentir. Bien entendu il doit se conformer à la réglementation en vigueur sur l'hygiène et la sécurité du travail même lorsque ses employés ignorent ce dont ils ont droit dans ce domaine. Il ne devra pas hésiter d'infliger des sanctions raisonnables en cas d'accident dû à la négligence d'un travailleur.

5. - L'EMPLOYEUR

doit pouvoir en contre partie, compter sur la détermination de ses employés d'oeuvrer pour la prospérité de l'entreprise. Ce souci est légitime et la pratique de la sécurité ne doit pas absorber la totalité des bénéfices qu'elle a contribué à réaliser. Il doit trouver auprés des pouvoirs publics la garantie sans laquelle il ne saurait engager des dépenses pour des améliorations d'aucune sorte. A ce sujet, je crois pouvoir avancer sans crainte de me trouver, que le Code d'investissement Camerounais est des plus libéraux.

6. - L'ETAT :

La décision de l'Etat est d'une importance capitale. En effet son rôle est considérable dans l'expansion des mesures d'hygiène et de sécurité. Il dispose de puissants moyens de propagande : radio, cinéma, conférences, diffusion d'articles; les services du Secrétariat d'Etat au Travail et aux Lois Sociales s'en occupent. Le contrôle doit s'étendre à toutes les catégories d'entreprises. L'Etat devra intensifier l'enseignement de la sécurité et de l'hygiène dans les écoles ménagères et techniques, lutter contre l'analphabétisme. Sur ce dernier point, le Gouvernement vient d'entreprendre un vaste programme d'éducation populaire connu sous l'appellation de ;" l'Ecole sous l'Arbre". Des résultats encourageants s'enregistrent chaque jour. Dans le même sens des Universités populaires créées par des enseignants privés fonctionnent dans plusieurs villes du Territoire. On comprend aisement que cette formation permettra aux travailleurs de suivre à l'usine les explications que pourront leur donner leurs patrons sur le fonctionnement d'une machine ou la nécessité d'un dispositf de protection. On a pu dire que le développement économique commence avec la santé et s'arrête avec la maladie des travailleurs. L'Etat Fédéré du Cameroun Oriental a besoin d'hommes forts, bien portants et valides pour assurer la progression constante de son révenu national. Pour ce faire il a le devoir de promouvoir et d'encourager tout ce qui peut contribuer à la protection de son capital humain. C'est pourquoi il doit lutter contre la sous-alimentation et surtout la malnutrition. J'ai eu l'occasion dans mon rapport final au Bureau International du Travail de faire état de l'alimentation du travailleur Camerounais. Les principes nutritifs - protides, glucides, lipides - indispensables à la vie d'un travailleur normal se rencontrent en quantité suffisante au Cameroun Oriental. Les gens souffrent plutôt d'un déséquilibre alimentaire dûe à la fois à la mauvaise répartition géographique des cultures de subsistance, aux difficultés des moyens de communication, à l'insuffisance des voies de communication, à la faiblesse du niveau de vie, pour ne citer que l'essentiel. Le rôle de l'Etat sera de favoriser l'acheminement des vivres vers les centres urbains, d'intensifier le commerce de viande entre le Nord et le Sud, de favoriser l'écoulement du poisson de la côte vers l'intérieur du pays, de freiner la tendance qu'ont les agriculteurs d'étendre les cultures d'exportation au détriment des cultures vivrières . Pour améliorer l'habitat et l'agriculture le Gouvernement a adopté depuis longtemps déjà le système d'accorder des prêts à moyen et long terme. Avec une telle politique, le Gouvernement arrivera en peu de temps à augmenter son revenu national et à élever le niveau de vie de ses habitants.

LE CONTROLE DE L'APPLICATION DE LA LEGISLATION

est de la compétence du Secrétariat d'Etat au travail et aux Lois Sociales qui comprend :

- Une administration Centrale constituée par la direction du cabinet, le service des études générales et de coordination, la direction du travail et de la sécurité Sociale qui traite entre autres de l'hygiène et de la sécurité des travailleurs en général, l'inspection médicale du travail et de la main-d'oeuvre;
- Des services extérieurs constitués par des circonscriptions de contrôle dites inspections interdépartementales du travail, des sous-circonscriptions ou postes de contrôle, un service d'orientation professionnelle, des centres de formation professionnelle. Pour faire fonctionner ces services le Gouvernement dispose d'un personnel encore insuffisant. En effet on compte un inspecteur du travail et des Lois Sociales, un médecin inspecteur du travail et de la main-d'oeuvre,

des contrôleurs, des contrôleurs-adjoints, le tout étayé par un corps de conseillers au travail de l'Assistance technique Française. Malgré le devouement de ce personnel, ces services ne donnent pas encore leur plein rendement encore que le rythme de l'industrialisation du pays est nettement en avance sur celui de la formation des cadres indispensables. D'où la nécessité d'étudier les moyens d'accélérer celle-ci. Les quelques gens en place consacrent la grande partie de leur temps aux fonctions administratives, au réglement des litiges, aux enquêtes sur les accidents du travail. Les visites d'établissements, les inspections proprement dites et leur rôle d'éducateur, deviennent du coup limités.

QUEL SERAIT LE ROLE DES PAYS MIEUX DEVELOPPES, DANS LA REALISATION D'UNE TELLE OEUVRE ?

Leurs vastes connaissances et leur longue expérience nous sont nécessaires dans plusieurs domaines. En effet, les organisateurs de nos services de sécurité et d'hygiène doivent s'inspirer des travaux effectués par d'éminents chercheurs à la suite de nombreuses années d'étude et de tatonnement. Il en est ainsi des textes relatifs à la sécurité - hygiène du travail, à la réparation des accidents du travail et des maladies professionnelles, aux tableaux des maladies professionnelles, etc...etc... Le soin qu'ils porteront à nous délivrer des machines munies des dispositifs de protection, contribuerait à la sécurité du travailleur Camerounais. Les moyens dont dispose actuellement mon pays ne lui permettent pas de faire face à ses besoins en personnel de contrôle. Ici aussi, l'aide des pays plus developpés et mieux outillés lui sera indispensable pour la formation rapide des cadres autochtones. Enfin nous avons pour longtemps encore besoin de leurs engins, de leurs bras et de leur tête pour nous aider à tirer de notre sol le" "trésor qui s'y trouve caché".

Pour terminer, soulignons à l'attention du lecteur, que si le Cameroun a besoin de l'aide des vieux Etats amis comme la France, l'Amérique, la Grande Bretagne, etc..., il est loin d'être malheureux. A vrai dire, la misère au sens propre du mot est inconnue au Cameroun qui a su former au cont act de la France des hommes capables de répondre aux plus pressants besoins de la Nation. En Afrique le Cameroun est l'un des rares pays qui ont été le mieux préparés à l'indépendance et, considéré dans son cadre africain, il est l'un des plus favorisés Nous sommes persuadés que bien étoffés notre législation du travail et notre appareil de contrôle nous permettront d'apprécier à leur juste mesure, les bienfaits de la prévention des risques professionnels./.

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International Labour Office

THE INTERDEPENDENCE OF HIGH-LEVEL MANPOWER PLANNING AND ECONOMIC PLANNING

By The International Labour Office

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No. 742
E.

The Interdependence of High Level Manpower Planning and Economic Planning

The International Labour Office

I.

1. The first question we face when attempting to "reconcile" high level manpower planning with economic planning is: what is their purpose ? What are we trying to achieve by high level manpower planning, and what by economic planning ?[1] The first, rather intuitive, answer to the high level manpower planning question is that we attempt to balance the supply and demand for high-level manpower. In other words we are trying to achieve a situation where all high level manpower is fully employed, and at the same time where the demand for high-level manpower is satisfied. This answer, however, is not satisfactory. It evades the question of what determines the demand for high-level manpower. A really primitive society has no demand for high-level manpower. A society which is not primitive does demand high-level manpower; the strength of this demand and its structure (i.e. the types of high-level manpower needed) depend on the level of development and on the structure of the economy. An underdeveloped country with a particular economic structure may have a strong demand for one type of high-level manpower, a much smaller demand for another type and no demand at all for still another type. A fully developed country has a much larger general demand for high-level manpower, and also the structure of this demand is usually quite different.

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[1] Some countries are said to use planning in the attempt to achieve the society's "ultimate goals", while other countries are said to abstain from planning. The division is not very clear; countries said to abstain from planning may actually do a lot of planning, limiting it, however, to a small part of the economy, or to sporadic measures affecting the whole economy decided on the basis of a general but rather vague plan. This is true particularly of some of the most highly developed countries which achieved a high level of development without general economic planning, and where the problem of further development consists of maintaining a steady rate of growth rather than of a rapid achievement of particular targets. But in many if not most of the countries in the process of development with which this meeting is specially concerned there is machinery for the drafting and implementing of more or less concrete plans for a specific period, such as five or ten years. In this paper we shall speak for convenience of "economic planning" or "the plan" as though all countries had a definite plan, even though in the case of some countries it would be more accurate to use some such expression as "the intentions of the policy-makers".

2. This dependence of demand for high-level manpower on the level of economic development and on the general economic (and social) structure is true at each point of time. It is thus true about the beginning as well as the end of each plan. During the time between the beginning and the end of a general economic plan the level of development and the economic structure will change, and from this change will result also a change in the demand for high-level manpower.

3. But the rate at which an economy develops and its structure changes depends in turn on a number of factors. It depends on the resources the economy has, on the new resources it develops, on the way in which the economy utilises all resources, and on the goals the society wants to achieve by utilisation of resources. One of the resources - and an important one - is manpower. The economic growth and structural changes which determine the demand for manpower thus depend themselves in part on manpower, including high-level manpower, on the way in which manpower is utilised, on the way new manpower resources are developed.

To recapitulate:

(a) the future supply and demand for high-level manpower are not independent but there are links between them; and

(b) these links are economic growth and structural changes.

4. This finding makes the problem of high-level manpower planning much more difficult as the supply and demand sides cannot (or at least should not) be considered in isolation. At the same time, it becomes clear that the purpose of high-level manpower planning cannot be limited to achieving a balance between supply and demand, it has to be extended also to the level at which supply and demand will balance.

5. The determination of the level at which there is a balance between supply and demand for high-level manpower, as well as for other types of manpower and for other factors of production, is of course the task of the economic plan. The economic plan, regardless of what ultimate goals it serves, seeks to reach a balance between supply and demand for each particular factor of production (including high-level manpower) at a level most compatible with achieving the ultimate goals. The level at which supply and demand for high-level manpower (or for any other factor of production) balance cannot thus be determined in isolation but only with regard to all other factors of production, and in each case the basic criterion has to be the achievement of "the ultimate goals" of the economic plan. The purpose of high-level manpower planning is thus the same as the purpose of economic planning.

6. This may seem a rather surprising statement, unless we consider what is the purpose of economic planning, and in fact what is economic planning itself. The purpose of economic planning is to achieve certain "ultimate goals"[2] which the society desires. These

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[2] Or "ultimate aims" in Tinbergen's terminology, or "fundamental aims" in the terminology of Oscar Lange.

goals may be expressed in very general terms, such as "a high level of development", "a high standard of living" or "full satisfaction of material and cultural needs". Such terms provide a general sense of direction in which the society wants to develop, but in order to be usable as criteria for practical action they have to be translated into more concrete terms. First, it is realised that such goals cannot be achieved this year, next year or within the next five years. If action is to be taken this year or within the next five years, it must be decided what to do in the near future to achieve the goals in a more distant future. The second point is even more important. The different elements in such a broad "ultimate goal" as a higher standard of living - e.g. a high level of employment, high wages, a high level of production, short working hours, good housing, general education, etc. - may be combined in different ways and may conflict one with another in the conditions of limited resources.

7. For practical action the "ultimate goal" must be therefore translated into more concrete targets or objectives which express the weight which the society attaches to each particular ingredient of the "ultimate goal". Targets or objectives need not be (and usually are not) purely economic; they may involve social, cultural and other considerations. The purely economic target may be expressed in a single formula: achieve the fastest growth of national income (or of G.N.P. or some other over-all measure of national economic performance). To this may be added other targets, setting specific social and other goals. The total plan might include as targets:

(i) maximum growth of G.N.P.;

(ii) at least five-year education for all children;

(iii) university education for at least 2 per cent. of the 23-year olds;

(iv) an old-age pension ($x p.a.) for everybody over 70;

(v) expenditure of $y p.a. for the armed forces.

8. There is, of course, a virtually unlimited number of possible combinations of targets. But such targets are not always consistent - target (v), for example, may conflict with (i). It will then be necessary to specify which are the over-riding objectives and which are to be achieved as far as is compatible with the over-riding ones (and, of course, to ensure that the over-riding objectives are mutually consistent).

9. The whole economic plan has as its purpose the attainment of all targets, and the high-level manpower plan must be geared to this same objective. The targets relating more specifically to high-level manpower and the resources available for attaining these objectives (the number of students to be trained, the number of potential teachers coming forward, and so on) will be derivable from a comprehensive plan. But it will be easier for the manpower planner if the educational targets are over-riding targets than if they are subsidiary ones. Different approaches to solving the problem of interaction between high-level manpower planning and general economic planning will be discussed in the next section.

10. Apart from the targets or objectives of each plan, there is another important element in planning - the means through which blueprints of plans are translated into reality. There are two basic aproaches to plan realisation: through compulsion and through inducement. In practice hardly any country will resort to one approach only, even in the same field: import restrictions (compulsion) and import duties (i.e. "negative inducements") may be used side by side. In the field of high-level manpower the inducement approach predominates, compared with direction of labour to particular jobs. In the inducement approach the most obvious element is the wage or salary differential which offers inducement to young people to study and acquire "high-level" qualifications and which could also be used to induce young people to study subjects where there is a serious shortage - e.g. agriculture, engineering - rather than subjects where the shortage is not so pronounced.[3] Scholarships may also be offered as inducement to people to acquire needed qualifications. When compulsion is used it does not have to extent to directing individuals to particular jobs. In countries where universitites are being established or extended the government may directly influence the allocation of students among subjects by limiting the number of places in some faculties and expanding the number of places in others. The government can use some compulsion not only in high-level manpower formation, but also in high-level manpower allocation. Firstly, being itself a large employer of high-level manpower, it has direct say in the allocation of a high proportion of such manpower. Secondly, it can influence the allocation of high-level manpower even outside the government employment, e.g. in a country where there is a shortage of doctors, who moreover tend to settle in towns leaving the rural areas without medical care, the government can achieve a more desirable distribution of doctors by limiting the number of licences to practice medicine in towns, and thus forcing new doctors to settle in rural areas.

11. On the whole, if enough attention is paid to the problem, there is no reason why the armoury of inducement and compulsory measures should not be extended to such an extent that high-level manpower is formed and allocated according to plan, without recourse to direct allocation of particular individuals to particular jobs.

12. There is a third element (after "objectives" and "measures") in planning which we should notice at this stage: time. Time enters into planning through two considerations: through the "time-preference" and through the "time-unit of planning". The first aspect, the "time-preference", is of course vitally important for the whole field of planning. The problem of allocation of resources between consumption and investment depends on the time-preference of the society. Just as an individual may be asked whether he prefers $100 now and $500 in ten years' time, or $200 now and only $300 in ten years' time, so a society has to decide, for example, whether it is willing to sacrifice some primary education two years hence for the sake of having more secondary education five years hence. Similar problems can also be faced in matters of health, housing and other

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[3] Or where, as is the case in some Asian countries, there is actually unemployment among graduates.

areas. But as soon as we attach a particular value to each consideration (e.g. to general five-year education, or to a comprehensive medical service) the problem is soluble on the basis of a single criterion of the time-preference - the rate at which we discount future benefits to make them as desirable as smaller, but immediate, present benefits. This rate of discount should be - and in fact usually is - incorporated in the general economic plan.[4] It determines the present value of the series of returns to be expected in the future from alternative courses of action in the area of high-level planning as in other departments of planning. Thus time-preference as such does not offer any particular problems for high-level manpower planners.

13. The same, however, is not true of the other aspect of time, the "time-unit of planning", that is the period for which a plan is drawn. Here we face a possibility of a difference between the arbitrarily-given period of the general economic plan and the period which is for technical reasons necessary for education of high-level manpower. When the "education period" is longer than the "economic plan period", two types of difficulties may appear.[5]

(a) in the absence of the future economic plan, high-level manpower planning is faced with the task of providing a supply to match an unknown demand;

(b) looking only at how much high-level manpower is needed to attain the targets of the current plan, planners may tend to neglect the training of the additional high-level manpower needed for the next planning period, since such training represents an input not matched by any output in the current plan.

14. The second of these difficulties could be taken care of by introducing into the current plan provision for the training of some high-level manpower over and above what will be needed for the current period. But the question remains: how is the magnitude of this provision to be determined in the absence of general economic planning for the next period? There is no fully satisfactory answer to this. A very rough-and-ready solution would be to use the figures of estimated demand for particular types of high-level manpower in all individual years of the current plan for trend calculation and extrapolation. Such a solution would, of course, be based on the unrealistic assumption that the future economic plan would follow the same path as the current economic plan. For this reason it seems preferable to adopt a solution based on the existence of two types of economic plan. The first would be the

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[4] This may not be visible at first sight. But if the plan stipulates, e.g. the rate of growth of national income and of investment, the difference between the two rates implies a decision on the rate of discount.

[5] Such difficulties are not confined to high-level manpower planning, but arise in connection with all investments whose gestation period is longer that the time limit of planning.

existing economic plan covering the period of, say, five years, and the other would be a longer-term general economic plan covering about 20 years. Of necessity the 20-year plan would have to be much less precise and less detailed than the five-year plan. Nevertheless, it should show the main proportions between the various aspects of the economy during the next 20 years, and thus provide a consistent basis for elaboration of the operative five-year plans, particularly in the fields such as high-level manpower formation, where the gestation period of investments is longer than the period of the operative plan. In this way high-level manpower objectives could be formulated on the basis of the 20-year plans and incorporated into the targets of the operative five-year plans.

15. One final point. We have spoken of the gestation period of investments in training high-level manpower, and of the present value of the series of future returns expected from such an investment. This does not of course imply that a purely materialist calculus can or should be used in determining the volume of resources to be devoted to education and training, or the allocation of these resources among different levels and specialities. After all, education is a consumer good as well as an investment.

II

16. In the first section it was said that high-level manpower planning and economic planning have a common purpose - namely to achieve certain "ultimate goals" of the society. These "ultimate goals" are for practical purposes translated into "targets" which may or may not include specific provisions ("sub-targets") concerning high-level manpower. However, even if some specific provisions regarding high-level manpower are included in the target, they are of a very broad character and must in any case be elaborated in more detail in order to serve as a blueprint for action.

17. Although general economic planning and high-level manpower planning have a common purpose, there may be conflicts between the two approaches. The existing structure of skill supplies not being sufficient for the immediate achievement of all economic objectives, expansion in high-level manpower formation is necessary in order to provide manpower needed for expansion in industry, transport and other sectors. This expansion in high-level manpower uses scarce resources (notably high-level manpower for teaching purposes, but also capital) which the general economic planner allocates with the greatest care among uses, trying to achieve the highest return to society from each invested unit of resources. Choices have to be made not only between sectors but also between techniques of production: a given output in a sector can be achieved with differing amounts of capital and with differing labour resources. For this reason, even if output requirements from a particular sector were known in advance and were considered to be optimal, the requirements of the sector for high-level manpower would not automatically follow.

18. The question arises as to how far choices between different products and different techniques should be influenced by the existing skill structure of the labour force. So far as choice between products is concerned, resources exist to satisfy wants, wants do not exist to utilise resources. It follows that the skill structure should be adapted and developed, as time goes on, to give the community the product-mix it wants, but with due regard for the additional opportunity costs of choosing a product-mix that makes specially heavy demands on high-level manpower by including or emphasising such products as, for example, space travel or nuclear deterrents. So far as choice between techniques is concerned, when a product that satisfies consumer wants equally well can be produced in either of two ways, there seems to be substantial advantage in selecting whichever technique is better adapted to the existing skill structure and thus makes fewer demands on scarce resources for the formation of additional skills. This proposition may need qualification, however, to take account (a) of differences in the arduousness or "disutility" of production by different methods, and (b) of the possibility that resources directed to skill formation to permit the employment of a particular production technique may serve other purposes at the same time. Additional knowledge or skills may be valued for their own sake as consumer goods, and they may in certain cases make a community more adaptable and enhance its capacity for development.

19. The question of reconciliation between economic planning and high-level manpower planning can be reduced to the question: should the economic plan be modified to take account of the structure of skill supplies, or should the latter be modified to conform to the former? Or is a full reconciliation best achieved by a compromise, but with one element being primarily the dominant factor, the "independent variable"?

20. Our discussion (in the first section) of the strong interdependence of general economic and high-level manpower considerations gives an indication that none of these methods of reconciliation can be considered as optimal. The reason lies in the interrelationship between high-level manpower considerations and other economic considerations in planning. Generally, planning has two qualities: consistency and optimisation. A good plan should be consistent; that is, supply and demand of all factors of production should balance, and it should be optimal, that is, the level at which the balance is achieved should in each case be the most appropriate for achievement of the target. Many plans are content with the achievement of balance, i.e. with consistency. Consistency in the plan is a virtue in itself: a non-consistent plan will give rise to difficulties and although some kind of balance will be achieved ex post, this balance will be at a "lower" (i.e. less optimal) level than a balance achieved by following a consistent (although not quite optimal) plan. Methods of reconciliation suggested on the previous page have the merit of consistency. However, these methods are unlikely to lead to an optimal plan, that is to a plan which is not only consistent but also optimal in the sense that it shows the most appropriate levels at which supply and demand for each particular factor balance.

21. The optimal method of reconciliation of economic planning with high-level manpower planning is to treat both as "dependent variable" one on the other. Only in this way is it possible to express the fact that the total demand for high-level manpower, and the pattern of this demand, depend on, inter alia, investment decisions, while investment decisions are in turn influenced by high-level manpower supply. When factors are considered as dependent variables the problem is to find the relationships between them, and then to solve the problem simultaneously. Technically, it would amount to finding the various equations linking high-level manpower supply and demand to other considerations, incorporating these equations into the planning model (which includes also a number of other, non-manpower equations) and "solving" the equations simultaneously. This method of reconciliation of high-level manpower planning with economic planning is inherently superior to any other method, but at the same time it is hardly practicable in the present state of knowledge of economic planning. The successful application of this method depends first of all on the availability of reliable data, not only on the various aspects of manpower but also on other economic phenomena. The second condition is the construction of a very detailed model showing the relationships between high-level manpower and all other economic factors. To this model would be then applied an optimisation technique showing the best pattern of development including the optimal rate of formation of high-level manpower (and its skill distribution) as well as its optimum allocation between alternative uses. The optimisation

technique would in most cases be based on the concept of shadow (or accounting) prices of factors of production, etc., and these would include also shadow prices of the various types of high-level manpower. Under the circumstances of an acute shortage of all types of high-level manpower these accounting prices would be of course very high, much above the existing salaries of such personnel. On the other hand, in those developing countries where there is a surplus of a particular type of high-level manpower (e.g. of lawyers) the shadow prices of such types of highly skilled personnel would be below the existing wage level, and in extreme cases the accounting prices would equal zero. The purpose of these accounting prices of particular skills is to achieve an optimal pattern of formation and allocation of high-level manpower, not to determine the actual salaries to be paid to people with particular skills. Nevertheless, the accounting prices can give some indication about the relative importance of different skills for economic development and thus indicate the direction in which particular salaries or wages could be modified under a flexible wage policy.[6]

22. In view of the difficulties of applying the first method because of shortage of reliable data and particularly because of the limitations of present programming techniques for processing data in the degree of detail required, we have to look for another method.

23. The second method of reconciliation, less demanding on planning technique, but possibly more laborious and definitely "less optimal", attempts to approximate to simultaneous solution of planning problems without actually using the simultaneous solution method. It does not take the economic plan as an "independent variable" to which the "dependent variable" of high-level manpower planning has to be linked, but proceeds by taking in turn the considerations in the economic plan and the considerations in the manpower plan as independent variable and the other as dependent variable, repeating the process several times. The use of high-level manpower information as alternatively a dependent and independent variable in relation to other economic information could, given a sufficient number of repetitions, give the same result as the simultaneous solution method. In practice it will not be possible to repeat the process more than a few times at the best, and the resulting plan will therefore remain some distance from the optimal solution.

24. What form this method of reconciliation will take in practice depends on the form of general economic planning in each

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[6] This modification of the salaries pattern in the light of accounting prices of high-level manpower corresponds to Harbison's recommendation that salary scales should reflect the "importance of the job" and not the extent of the individual's formal education, such as the number of degrees he possesses, etc. (F. Harbison: "The Strategy of Human Resources Development in Modernising Economies", Problems of Accelerated Growth and Manpower Planning in Developing Economies, The Institute of National Planning, Cairo 1962, p. 13.

particular country. Basically this method rests on considering higher education (or high-level manpower formation) as one economic sector, the output of which is (a) the input of the other sectors; (b) its own input (e.g. teachers) and also (c) the contribution to the "final bill of goods". (The last-mentioned use of the "education output" is of considerable importance, as it takes care of the usual objection of educationalists that economic development requirements are not the only justification for educational expansion.) The method can thus be applied in a number of ways, ranging from some type of input-output model[7] to the Soviet system of balances to less aggregate methods. The interaction between high-level manpower considerations and economic considerations then takes place at various levels, from the national level downwards.

25. However, whatever the type of planning and the corresponding form of reconciliation, there are a number of relations between high-level manpower and economic aspects of development which all types of planning have to take into consideration. Let us, for example, take the case of the construction of a steel mill of a given capacity. How many people of university (or equivalent) educational level will be needed for the construction? What will be the proportion of various skills? If there is another technique of steel mill construction (say, more labour-intensive), will there be different high-level manpower requirements, either in total number or in the proportion of skills? What will be the high-level manpower requirements for operating such a steel mill? Or let us take an example from the supply side. Suppose that manufacturing will require 100 more electrical engineers than could be provided from existing institutions. How many more people will have to attend university and secondary schools in order to provide for the 100 extra electrical engineers, keeping in mind that the secondary school-leavers are also scarce, that there is some wastage and that an increased number of secondary school and university students will require also an increased number of teachers and university lecturers. The additional demand for 100 electrical engineers may thus result in increasing the number of secondary school enrolments by 150, electrical engineering students by 120, of mathematics students by five, of physics students by three, history students by 2, etc. This type of information[8] is important for all types of high-level manpower planning, particularly for our method aiming at reconciling it with general economic planning on as equal a basis as possible. Some of the relations between high-level manpower and

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[7] In that case it may be solved simultaneously and become in fact our first method. But it is possible to use the input-output framework without simultaneous solution.

[8] It will be observed that this type of information has a strong resemblance to technical coefficients in input-output tables. In fact, if planning were done with the help of some input-output model, with a very great number of sectors (education itself being broken into a number of sectors), the answer to each of the questions asked here would represent (after translation into the common unit of the model) a technical coefficient.

economic variables may differ according to the peculiar situation of each country, but many - one may suspect most - will be very similar for most underdeveloped countries. Assuming the continuing existence of planning in developing countries and the acute shortage of high-level manpower in most of them, research into these relationships would be most useful.

26. The second method of reconciliation between high-level manpower planning and economic planning attempts, as we have said, to approximate the optimal simultaneous solution by alternatively taking one independent and the other as dependent variable. The number of these alternatives being limited, there is some point in considering which will be taken first in which role. In view of the fact that resources exist to satisfy wants and not the other way round[9], it seems logical to take, in the first step of the process, the general economic plan as independent variable and to adapt high-level manpower considerations to it. In the second step the imbalance between supply and demand of particular skills is taken into account, and the economic plan is changed, to some extent, in order to remove the imbalance. This may be done either by leaving out or scaling down some projects for which not enough high-level manpower would be available, or by using techniques that are better adapted to utilise available skills, or by increasing training facilities, again of course at the expense of some non-manpower projects, or by a combination of these approaches. Sometimes the reconciliation process ends here, securing, more or less, consistency, but remaining rather far from optimal allocation of resources. The success of such an approach depends to a great extent on the general economic plan having already taken at least some account of the high-level manpower considerations, as otherwise the imbalance in particular skills might seriously endanger the implementation of the plan, or alternatively measures taken to secure high-level manpower balance could disturb balance among other factors in the general economic plan.

27. There is another method of adaptation of high-level manpower planning to general economic planning. This method may provide for cases where the period of gestation of investments in manpower exceeds the period of the plan, and for cases where the general plan is not worked out in detail. It has an advantage in simplicity. It consists of taking the general economic plan and drawing a high-level manpower plan to fit it, not on the basis of elaboration of the economic plan, but rather on the basis of analogy with other countries. The method is based on past experience in other countries showing rather stable relations between economic and high-level manpower factors at a given stage of development. Perhaps the most obvious is the relation between education expenditure and gross national product, which gives the first clue about the percentage of G.N.P. an underdeveloped country can profitably allocate to education.

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[9] This is not of course to deny that some manpower objectives such as education have an intrinsic value apart from what they contribute to economic development.

Table 1

Expenditure on Education as a Percentage of Gross National Product

	Percentage of G.N.P.
Mediterranean countries (Greece, Italy, Portugal, Spain, Turkey, Yugoslavia)	2.65
All O.E.E.C. countries	3.21
Soviet Union	3.74
Canada, U.S.A.	4.47

Source: O.E.C.D.: Policy Conference on Economic Growth and Investment in Education, (1961), O.E.C.D., 1962, Vol. II, Table 9, p. 80.

28. Similarly, allocation of education expenditure between primary, secondary, vocational, technical and university levels can be done with regard to the pattern of expenditure in countries which were at a similar level of development. This approach can be used also for deciding the skill pattern of university graduates, the ratio of university graduates to intermediate level personnel, etc. It is important to realise, however, that these relationships do not necessarily imply any causal connection between education expenditure and economic growth.

29. While the chief value of this approach seems to lie in the help that it may give in overcoming problems resulting from a discrepancy between the period required for high-level manpower formation and the period of a relatively short-term (say five-year) plan, this approach might also be used as a way of harmonising manpower and general economic targets within a shorter plan period. It might be used for this purpose either alone or as a check on the second method of reconciliation. The help of highly developed countries can be particularly useful here, as many of the relations to be applied in underdeveloped countries represent the relations in the developed countries, say 50 years earlier. This method, however, should be used with particular caution and only after a thorough research, in order to take into account differences in economic structure, traditional patterns, geographical conditions, etc. While this method may be of much use, there are probably more conceptual, economic and statistical traps here than in the other methods of reconciliation of high-level manpower planning with economic planning.

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ON THE APPLICATION OF SCIENCE AND TECHNOLOGY
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Agenda Item: B.3

Netherlands

MANAGEMENT EDUCATION THROUGH ASSIGNMENTS IN INDUSTRY

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Papers have been contributed to the United Nations Conference on the Application of Science and Technology for the Benefit of the Less Developed Areas as working papers for that Conference. They are published as presented by the contributors, and the contents and the views expressed are those of the contributors. (See notes overleaf.)

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MANAGEMENT EDUCATION THROUGH ASSIGNMENTS IN INDUSTRY

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MANAGEMENT EDUCATION: Principles and integrated application.

1. Management science stands midway between the natural sciences, where experiments and laboratory work are of prime importance in imparting knowledge, and national economics and sociology where controlled experiments are hardly possible. The laboratory of management science is industry itself and it is of great importance to find ways and means to train students of management science in industry without endangering the normal functioning of the enterprise.

2. The enterprise as a whole is a complex field of study; management science divides the field of management into a number of sectors such as production, marketing, personnel management, costing and financing. Each sector comprises many fields of study, for instance in the sector production problems of lay-out and routing, planning, lot-size, etc. In general for each of these elementary fields of study a theoretical solution can be found if the ceteris paribus condition is applied. The theory of management science gives a number of guiding principles for each element of the enterprise.

3. However, analysing and improving the situation and structure in an existing enterprise is a completely different proposition. Here the student would have to start by measuring or recording the existing situation element by element, for instance the element lay-out. In other words he will make an abstract model highlighting only that particular element like a lay-out sketch with routing. Then he will measure in how far the existing situation differs from the guiding principle.

4. Having done this for all elements separately he will try to find an integrated solution for the enterprise as a whole. This solution will also have to take into account the market expectations and future policy of the firm; it may also be necessary to estimate funds available for improvements as well as the returns to be expected therefrom. Of course in an actual situation he will not have to analyse all elements thoroughly at the same time as some of them may prove to be obvious. He will then select one or more important improvements which are considered feasible and profitable. In most cases it will be possible to arrive at a reasonable solution by simply assigning weight to the other factors and keeping them in mind while solving the element in question.

5. This integration process, proceeding from improvement of elements to an integrated plan in which financial consequences, future expectations and business policy are properly accounted for, is a very difficult one and requires experience, ingenuity as well as an insight in the interdependence of the element problems and furthermore a common denominator.

6. Last but not least a practitioner must be able to "sell" his solution to management. Some managers will be more interested in production, others in marketing or financing. The practitioner must therefore assess the "climate" of the enterprise and present his solutions accordingly.

7. The guiding principles of management science can easily be taught in

class by means of lectures and exercises. It is more difficult, however, to teach the process of integration. In future operations research and business games may be the means to deal with important facets of the integration process in class.

8. At present case-studies, such as used by the Graduate School of Business of the Harvard University, provide the possibility of simulating this integration process. Such a case-study gives an elaborate description of a particular firm as a total and its different aspects. This description forms the basis for a class discussion evaluating the existing situation ("would you invest in this firm?") and formulating suggestions for improvement. During the discussion the discussion leader can add a touch of reality by formulating assumptions pertaining to cost and impact of improvements and by doing so highlight the process of integration of all aspects in an optimal solution.

9. Actual study in industry, however, provides the student with a realistic opportunity for the translation of guiding principles into practical dynamic action. Instead of reading a more or less abstracted systematic description he is faced with the baffling day-to-day complexity of a real situation. He must first record, than analyse and by careful weighing come to a balanced solution. Then the manager has to approve the proposals and finally the student has to assist with implementation and to evaluate the results.

10. All the time he has to work full time in the enterprise and after one or a few of such experiences, preferably in different firms, he will have gained a deep insight into the actual operation of an industrial enterprise.

ASSIGNMENTS IN SMALL INDUSTRIES: Project Set-up

11. Small industry offers very good possibilities for a student executing an in-plant assignment; the student is able to oversee in a limited time all activities in the plant and get "the feel of it".
His analysis of the existing situation will take into account all the sectors of the enterprise and so he can more easily arrive at an optimum solution which is in line with the overall policy of the firm.

12. In general, however, the small enterprise will not have a man available to guide the work of the student; its staff of the small firm is as a rule overburdened and has not the training and background necessary to give the student the necessary guidance. The student will therefore have to be coached by an outside supervisor who will be able to supervise a limited number of students simultaneously.

13. As the student will have to work rather independently and cannot fall back on staff departments, he must be made acquainted beforehand with the necessary tools, viz. the recording techniques by means of an applied course.

14. Supervision and coaching as well as the applied course in recording techniques make it imperative to execute in-plant work in small industries on a project basis.

15. Since 1953 the Research Institute for Management Science (RVB), Delft (Netherlands), has executed several of such projects for various groups of students (both Dutch and foreign).
The following remarks are based on 9 years of experience during which approximately 380 students participated in such projects.

CARRYING OUT A TYPICAL PROJECT

16. The first programme of in-plant work in small industry executed by RVB was held in the fall of 1953. The participants were advanced students of the Technological University in Delft in their last year before obtaining a Master Degree. Although later on several projects were executed for different groups of trainees, these other projects represent only minor variations on a theme which had proved successful and will be dealt with later (vide 37-43).

17. Some of the main characteristics of this first project will be described in the following.

Structure of the programme

18. The students were given a four weeks course followed by assignments in small enterprises. Ten students participated in this project and were placed in ten industrial enterprises such as a biscuit factory, a cask factory, a factory producing metal furniture etc.

Selection of the participants

19. A first requirement for participation is that the student is interested in working in a small or medium-sized firm; secondly, he must be able to work rather independently and thirdly he must be able to adapt himself to the various circumstances and to establish and maintain pleasant contacts on the different levels. As the emphasis is on down-to-earth practical improvements involving only limited expenditure, this kind of work is certainly not suited for the more scientifically orientated student.

20. The selection was based on recommendations of the student's professor or supervisor and a personal interview; in some cases simple psychological tests were used.

Applied introductory course

21. The introductory course has to be an applied one in the most literal meaning of the word. If the students have already studied the principles of scientific management within the framework of their regular studies, only a very short refresher is required.

22. A major part of the time available is then devoted to the analysis of the production process and work methods study. Practical experience has to be introduced into class by means of case-studies. Furthermore short practical team studies in a plant are included in the programme, such as a three days work study project.

23. Of course the objective of such a course can never be to make the student a time study analyst but to give him sufficient working knowledge of the techniques in order to be able to analyse the production process in terms of time utilization, operation times, work methods, lay-out, etc.

24. As much as possible students should be brought together from time to time to discuss case-studies made of practical problems encountered during their experience. These problems can be taken from every type of industry as they have to illustrate more an approach to the problem than a solution of a particular problem.

Individual assignments in industries

25. The firm participating in the project has to be selected by the project supervisor, soliciting the co-operation of the management; in general he will have to guarantee that the study will be treated confidentially. Then he has to decide in consultation with the manager what kind of assignment should be carried out by the student, after having visited the firm and having surveyed the plant in a general way. Also the co-operation of lower echelons of management should be ensured. Care should be taken that the workers are informed about the nature of the activities of the student in the firm.

26. Before being introduced in the firm by the supervisor, the participant is given a written assignment specifying the general direction of the study and the necessary recordings that have to be made first.

27. The assignment will include basic data about the firm and its management, the name of the coach and a rough time schedule for the work to be performed including the report and date of submission of the draft.

28. Whenever possible a staffmember of the firm is assigned as liaison-officer.
29. The assignment comprised making an analysis of the process and finding eventual bottle-necks or the operations where the highest amount of value was added.
He then had to try to improve these operations and if necessary also other operations in order to streamline production.
30. Out of the 13 weeks of the total assignment approximately six weeks were reserved for analysis and the development of proposals for improvement. Then an interim report had to be presented to the management, while the balance of the period was reserved for assisting management in the implementation of the suggested improvements.
31. At the end of the period the student had to present a final report evaluating the proposals and the improvements actually realized.
32. Great emphasis was placed on acquainting the student with the problem of presenting his plans for improvements to management, overcoming eventual resistance during implementation.
33. During the in-plant studies each student was visited once a week on the average by the coach who reviewed the progress of the work and gave suggestions for further action. It was preferred to visit the plant because of personal contacts with the firm's management.

Contact with management

34. During the in-plant period it is advisable to inform the management about the type of work the students are doing.
In some instances information meetings were held; the managers of the different enterprises were invited to an evening meeting. After a short introduction by the programme supervisor concerning the objective and the structure of the programme two students gave an account of the work they are doing. Subsequent discussions offer an opportunity to make the managers better acquainted with the project in particular and the possibilities of improving the working of the enterprise in general.

Evaluation

35. In cases where the study culminated in the actual implementation of the suggested improvements, the success of these improvements could be measured at the end of the study.
However, frequently it was found that introduction of the suggestions was not feasible within the allotted period. Then the final report was evaluated by both the management and an experienced outsider, for instance a professor in industrial management.
36. While management would of course concentrate on the feasibility of the proposals, the outsider would try to measure in how far the student had understood what he had done and how far the study had added to his insight into management problems.

EXPERIENCES IN THE NETHERLANDS

Other projects

37. After the projects for students of the Technological University proved a complete success, similar schemes were introduced for other groups of trainees.
38. These projects had different training objectives and therefore the structure of the programmes differed as well as the assignments in industry. Common to all projects was a period of classroom work followed by a practical in-plant study.
39. The students from Technical Colleges (Bachelor's Degree) followed a

programme identical to that of the University students (Master's Degree). The assignments in the former case were on the average more limited, due to differences in background of the students.

40. A programme for management assistants in small enterprises was set up as a contribution towards succession problems; in many small firms a young man is earmarked for future succession and has to work in the firm to get the necessary experience. During these formative years he could profitably act as an all-round assistant to the manager. The programme was designed to supply him with the necessary training for this function, and consisted of an applied course followed by supervised assignment in his own firm.

41. For young staff specialists the programme was designed to shorten the breaking-in period. Also here the supervised assignment was carried out in the student's firm. Participants were mostly young graduate engineers and economists.

42. It was found that students in engineering and economics in the last year before attaining their Master Degree could very well co-operate in research projects. In this case the students acted as research assistants gathering data in industrial firms. The student could do some scientific work and at the same time get some in-plant experience.

43. The in-plant training of international graduates is carried out within the framework of the "Six months International Course on Small-scale Industries", organized by the RVB. This course comprises a 3 months programme of classroom work, including lectures, exercises and case-studies, followed by a 10 weeks period of supervised in-plant work. The objective of this course is to acquaint persons from industrial development organizations in newly developing countries with the problems of small industry and to highlight measures for the promotion of a sound small industry. The theoretical programme of three months has therefore a wider task than the applied course of the student projects. The necessary recording techniques are only a part of this theoretical programme. The in-plant assignment has also a different character. In some cases a study resulting in suggestions for improvement is not possible and the assignment is therefore more descriptive. The student learns to describe an actual industrial enterprise. Often this description forms the basis for a scheme for the setting up of a similar enterprise in the home-country of the participant.

Task of the supervisor of an in-plant training project

44. In carrying out such a project it was found that the supervisor is the most important factor for a successful execution of the work. Although he will probably also play a role during the theoretical part of the course he has the task to co-ordinate the several objectives of the assignment:

. training: the assignment must be in accordance with the training needs of the participant (depending on his educational level) and must have his special interest (for instance a certain branch of industry). This objective can of course be reached more easily if a strict selection of the participants is possible;

. examination of plant problems: the supervisor must see to it that a suitable problem is chosen so that in the limited time available results can be obtained, of interest both to the student and the enterprise.

45. The above implies experience of and insight into the practice of consultancy work as well as into training aspects.

46. Furthermore the supervisor's personality must enable him to have pleasant contacts with the management and the student.

47. In order to achieve a reasonable time utilization the supervisor will have to coach about 4 - 9 students at the same time, depending on his other duties within the scope of the project.

48. Due to the project set-up all students will start their in-plant pro-

gramme at the same time. A great deal will depend on his ability to work independently and to plan his work adequately.

49. The supervisor should preferably not be under 30 years of age and have an academic degree and industrial experience to ensure his authority. It is furthermore advisable that he gives some lectures or leads some class discussions in the preparatory course to familiarize himself with the students. If possible he should participate once in a student project himself.

50. The RVB organized special supervisor-courses in which the supervisor was trained in the set-up of a project and the determination of assignments in industry.

PRE-REQUISITES FOR SIMILAR TRAINING IN LESS DEVELOPED AREAS

51. From the foregoing it can be gathered that there are certain pre-requisites for the successful execution of such projects. Some of them are evident, such as the availability of suitable industries, students and supervisors.

52. However, in projects carried out in the Netherlands the institutional framework proved to be of great importance. For instance the projects for Master and Bachelor Degree students were conducted in co-operation with the Ministry of Education and the Ministry of Economic Affairs; these authorities subsidized the work so that the industries had only to pay a nominal fee.

53. It is recommended to charge a small fee to the industries as they will in general not think highly of advice given for nothing and will therefore not be prepared to give their full co-operation.

54. In many developing countries in-plant training projects could conceivably be organized by an extension institute for small industry in co-operation with a University or College.

55. The assistance of manufacturers associations, federations of industries, chambers of commerce and similar bodies is of course very important. Labour unions should be given information concerning nature and objectives of the project and the value of efficiency improvement in general.

56. Of paramount importance of course is the man who will build up an organization for the execution of such projects.

57. For each particular project a scheme will have to be drawn up including inter alia:

- objectives
- size of the project
- cost of project and sources of funds
- number of years the project is to be run
- organization
- time schedule
- personnel requirements

58. In general it will not be practical to establish an organization for just one project and there will have to be designed an institute with a much wider range of activities in which the individual projects can be fitted in.

59. Such an institute might conceivably promote efficiency in other ways, for instance by consultancy and advisory services to enterprises, by creating documentation services and by the dissemination of information, by establishing research laboratories for development and demonstration of new working methods etc.

60. It is evident from the foregoing that all these activities and more especially the student training in industry will depend on getting industry itself interested in such projects.

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Agenda Item : B.1

Sweden

NEW SURVEY TECHNIQUES APPLICABLE TO LABOR FORCE SURVEYS IN LESS DEVELOPED AREAS

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New survey techniques applicable to labor force surveys in less developed areas

by

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1. Purpose and scope of the paper.

Considerable theoretical and methodological progress has taken place in the domain of statistical surveys since about 1950. The new techniques at the disposal of to-day's survey statisticians are largely of a world-wide applicability.

Among these new techniques there are, however, some which seem to be especially suitable for labor force surveys in less developed areas. It is the prime purpose of this paper to focus the attention of the reader on this particular aspect.

An exhaustive discussion of the subject is outside the compass of this short paper; the interested reader is advised to consult the references quoted in the text.

The aim of the paragraphs 2 and 3 is to provide the necessary institutional frame of reference for the presentation of four selected techniques in the following paragraphs.

2. Characteristic features of labor force surveys.

The term "labor force survey" will be used in this paper in a strictly technical sense. Thus, it will denote a system adapted in the United States, Canada and some other countries for the compilation of statistics of employment and unemployment by means of interview surveys. More specifically, it is characteristic of labor force surveys that

a. they are carried out as sample surveys;

b. they are repetitive surveys; they are carried out several times a year;

c. they make use of the panel technique, in combination with rotation sampling; and

d. the observations are collected by personal interviews.

For a general methodological review, reference[1] is given to International Labour Office (1948). Eckler (1961) should be consulted for a detailed description of a technically advanced application.

3. Crucial design conditions for statistical surveys in less developed areas.

It is significative of sample survey work in statistically advanced areas that it aims at the construction of practically (as distinguished from theoretically) optimum sample survey designs. For an illustration, the reader is referred to Hansen et al (1953); the discussion, p. 4-10, of "criteria for choice of good sample designs" is especially illuminating. The successful application of criteria such as those presented in this reference prerequisites the identification and evaluation of the "crucial design conditions" prevailing in the area under consideration.

We will assert here that sample survey work in less developed areas should, in principle, be based on the same criteria as those adopted in advanced areas.

In order to be able to illustrate the implication of this choice of criteria for sample survey work, we list here four points which are likely to appear on a list of crucial design conditions in less developed areas:

a. scarcity of well-trained statisticians, especially sample survey experts;

b. scarcity or lack of large-scale computers;

c. existing population registers are incomplete;

d. basic statistical information is unreliable.

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1) Complete references are given in paragraph 9.

We will interpret this list to suggest that the choice of sample design should aim at

(i) the achievement of considerable technical and administrative simplicity; and

(ii) the application of techniques which permit an efficient use of inadequate resources.

In paragraphs 4-7, we will present four sample survey techniques of a recent origin which seem to be especially suitable for labor force sample surveys in less developed areas, where one or several of the four conditions listed above apply.

4. Replication.

The use of replication represents a feasible basis for sample survey work in areas with a scarcity of sample survey experts and lack of large-scale computers. For an extensive presentation of this technique, reference is given to Deming (1960). A hint of the basic idea will be given here by means of a simple example:

A sample survey is to be carried out to estimate the total number T of employed persons, 14 years of age or older. We select (to be specific) independently 10 "small" samples, replicates, and compute the 10 estimates

$$t_1, t_2, \ldots\ldots, t_5, \ldots\ldots, t_{10}$$

of T. Thereafter, we compute the overall estimate

$$\bar{t} = \frac{1}{10} \sum_{i=1}^{10} t_i$$

of T. The precision of t can be measured by the variance estimate:

$$s^2(\bar{t}) = \frac{1}{10} \cdot \frac{1}{9} \sum_{i=1}^{10} (t_i - \bar{t})^2$$

The computation of $s^2(\bar{t})$ is (usually) much simpler and faster than the corresponding computation, when replication is not used. It must be observed, however, that we must be prepared to pay a price for these gains in terms of decreased precision.

Replication may also be exploited for purposes of controlling non-sampling errors. References are given to Hansen et al (1961) and Lahiri (1958).

5. A technique for efficient use of an incomplete register.

In order to put probability sampling into practice, it is necessary to have access to a "frame", that is a list of the set of sampling units among which to select a sample; obviously the use of multi-stage sampling calls for a corresponding hierarchy of frames.

It is often, and rightly, emphasized that in order to be satisfactory, the frame has to be (virtually) complete. This should, however, not be interpreted to mean that an incomplete list of units cannot be effectively exploited in the sample selection procedure. We will briefly outline a suitable technique for such a use by means of a specific example.

At the final stage of a certain multi-stage sample design, a sample of dwelling units is to be selected from among the 14 dwelling units of a block. There exists a "dwelling unit directory" for this block, but it is not complete.

Consider a unique rule for numbering the dwelling units of the block, e.g. by reference to street and street-number. Such a numbering, if carried out, would create a complete sequence

$$U_1, U_2, \ldots U_{10}, \ldots, U_{13}, U_{14}$$

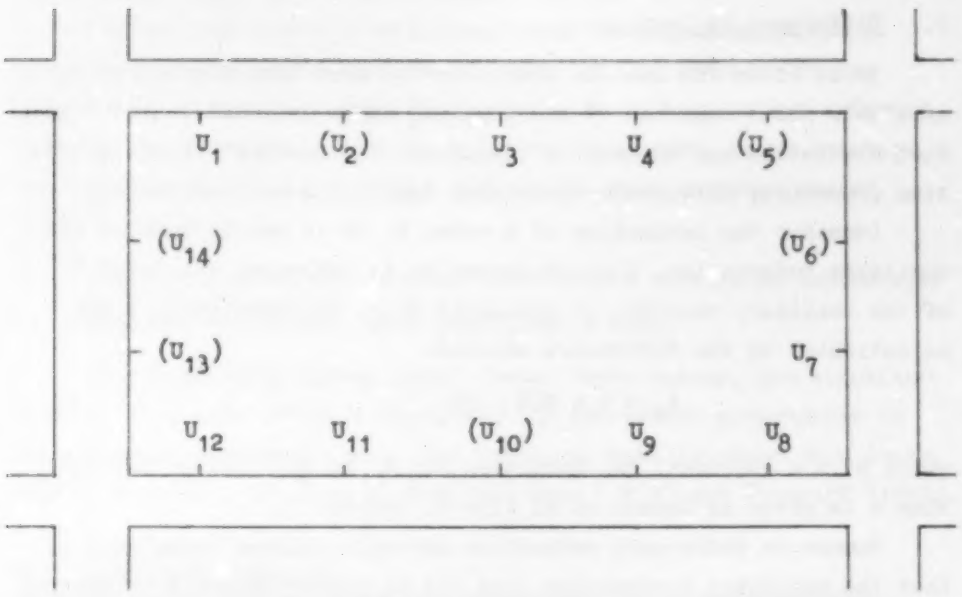
of dwelling units. However, instead of the complete sequence above, we have the following incomplete sequence

$$U_1, (U_2), \ldots, (U_{13}), (U_{14})$$

where the parenthesis ( ) symbolizes that the unit concerned is not listed in the directory. The situation is illustrated by means of the map on the next page. As shown there, the indexing 1, 2, ... 14 has been made in a systematic fashion round the block.

For purposes of sample selection, a dwelling unit not listed in the directory will be linked with one and only one dwelling unit listed in the directory. The rule to use in this process calls for the following linking:

(U_2) is linked with U_1 ;
(U_5) is linked with U_4 ;
(U_6) is linked with U_4 ;
(U_{10}) is linked with U_9 ;
(U_{13}) is linked with U_{12} ; and
(U_{14}) is linked with U_{12}



Thus, a dwelling unit not listed in the directory is linked with the nearest preceding unit.

The actual selection of a sample of dwelling units where to make interviews may be arranged as follows. A sample of dwelling units is first selected from the directory; this sample may e.g. be made up by U_3, U_9 and U_{12}. The interviewer is then instructed to make interviews not only in these three dwelling units but also in those dwelling units linked with these units. Thus, (U_{10}) is to be included in the survey, as are (U_{13}) and (U_{14}).

For a realistic illustration of an application of this technique to a large-scale sample survey, reference is given to Jabine et al (1961).

The alternative approach to the frame problem in the case discussed is to have a separate pre-listing operation precede the selection of the sample of dwelling units, in order to create a complete list of dwelling units from which to select the sample. Such an operation may be expensive.

6. Difference estimation.

It is often the case in sample survey work that statistics are available about each one of the sampling units included in the frame. Such statistics may be used as "auxiliary information" in the estimation procedure; difference estimation represents one such means.

Consider the estimation of a total T. If no use is made of the auxiliary information, T is estimated by t; likewise, the total Y of the auxiliary variable is estimated by y. Alternatively, T may be estimated by the difference estimate

$$t_\theta = t + \theta(Y - y)$$

where θ is a constant. The condition for t_θ to be a better estimate than t is given in Hansen et al (1953), chapter 11.

Common to difference estimation and some related techniques is that the auxiliary information need not be either accurate or current in order to be fit for use. In order to bring out the significance of this fact, we consider a labor force survey, the sample design of which embraces the use of parishes as sampling units. For each such unit in the frame, the approximate number of inhabitants as of some previous year is known, as recorded in a census; the sum of these numbers is the total Y of the auxiliary variable and is estimated by y. The fact that difference estimation makes no demands for up-to-date, accurate statistics and is relatively simple to apply, makes this technique especially attractive for use in less developed areas.

The attention of the reader is also drawn to composite estimation, as discussed in Hansen et al (1955).

7. The surprise-stratum technique.

Suppose we are carrying out a labor force survey, making use of "area sampling". The design calls for the selection of dwelling units within a sample of blocks in cities and segments in non-urban areas.

For such a design to be effective, it is important to identify in advance all areas with a large population, in order to be able to exercise a control of their impact on the estimates. Such a control may make use of stratified sampling or sampling with probabilities proportional to estimated size.

Clearly, the identification mentioned above prerequisites up-to-date, reliable statistics. In spite of our efforts, it may happen that we overlook some large areas. If such areas are selected, they are appositely referred to as "surprise units". In an one-time survey, such units may be dealt with in two ways, neither one of which is attractive:

a. they are kept in the sample; this results in a large variance; or

b. they are "rejected"; this introduces a bias.

In a repetitive survey like a labor force survey, the surprise-stratum technique offers a statistically attractive alternative to the two ways mentioned above. For technical details about this technique, reference if given to Kish and Hess (1959) and Woodruff (1959).

8. Some final remarks.

Because of space limitations, the previous discussion has concentrated on four selected new techniques which should find important applications in sample survey work in less developed areas. For a much fuller presentation of recent advances in sample survey theory and methods, reference is given to Dalenius (1962).

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C O R R I G E N D U M

Please note change of agenda item from B.1 to B.2.1

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